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Case Report

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Successful judgment-based steroid management of bevacizumab-induced acute kidney injury with suspected renal-limited thrombotic microangiopathy in a patient with colon cancer: a case report

Abstract

It is challenging to identify the aetiology of acute kidney injury in cancer patients since it can be multifactorial. Renal-limited thrombotic microangiopathy (rTMA) is a rare but recognized complication associated with certain antineoplastic therapies. Diagnosing rTMA in the context of bevacizumab therapy requires a high level of suspicion. In here, we report steroid responsive acute kidney injury associated with induction therapy with bevacizumab therapy.

Keywords: microangiopathy, bevacizumab therapy, kidney, angiogenesis

Volume 13 Issue 1 - 2025

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Received: October 31, 2025 | **Published:** November 13, 2025

Introduction

Bevacizumab is a monoclonal antibody that targets vascular endothelial growth factor.[1] Its mechanism of action makes it effective against tumor types driven by angiogenesis.[2] The role of VEGF in cancer progression is evidenced by increased intra-tumoral VEGF expression levels, which correlate with a poor prognosis and more aggressive disease in several solid tumor types, including metastatic colorectal cancer (mCRC).[3] However, the use of bevacizumab is not without its risks. Adverse effects associated with this drug include acute kidney injury (AKI), proteinuria, hypertension, and thrombotic microangiopathy (TMA).[4]

Renal-limited thrombotic microangiopathy (rTMA) is a rare but recognized complication associated with certain antineoplastic therapies. The occurrence of rTMA is likely under-recognized, as its clinical presentation can resemble other causes of kidney injury in cancer patients, particularly when AKI presents without the typical signs of systemic TMA.[5] Diagnosing rTMA in the context of bevacizumab therapy requires a high level of suspicion. Although cases of rTMA have been documented, the exact mechanisms behind it remain unclear, and there are still gaps in the understanding of its prevalence, pathophysiology, and optimal management. As a rare and somewhat controversial complication, rTMA is usually identified only after excluding more common causes of renal injury. Prompt discontinuation of the offending drug is usually recommended, and supportive care is the primary approach; however, steroid therapy has shown potential efficacy in some cases.[6] Currently, FDA-approved treatments, such as Eculizumab, it is indicated for specific TMA types like atypical hemolytic uremic syndrome (aHUS) but are not well-established for Bevacizumab-induced renal-limited TMA, with most evidence coming from case reports and limited studies.[7]

Here, we report a patient who developed severe proteinuria and acute kidney injury following bevacizumab therapy for metastatic colon cancer. Although renal-limited TMA was suspected, biopsy confirmation could not be performed. The use of steroids was found to be dramatically effective in this case, resulting in the resolution of the kidney injury.

Case report

A 72-year-old Saudi male with a medical history of colon cancer with liver metastasis, type 2 diabetes mellitus, hypertension, benign prostatic hyperplasia, and chronic kidney disease (CKD) stage 3a (baseline creatinine: 1.3 mg/dL) was admitted to the hospital on February 11th under the oncology team for the first dose of Bevacizumab (900 mg in 100 ml 0.9% NaCl over 90 minutes) as a day-case admission. The patient was planned for discharge post-therapy.

However, during the infusion, the patient developed a fever with chills. Blood cultures were drawn and revealed Gram-negative bacilli. The peripherally inserted central catheter was removed, and the patient was started on a course of Piperacillin-Tazobactam and Vancomycin, with antibiotic doses adjusted according to the patient's creatinine clearance. By February 12th, the patient's creatinine rose from the baseline of 1.3 mg/dL with eGFR 55 mL/min/1.73 m² (two days prior to Bevacizumab administration) to the level of 4.53 mg/dL. This rise was accompanied by oliguria and moderate-to-severe metabolic acidosis.

Nephrology team was consulted, and the patient was transferred to the Intensive Care Unit (ICU) due to borderline blood pressure, oliguria, and rapidly progressive renal dysfunction. During ICU management, he was closely monitored by the nephrology team. The

diagnosis of oliguric acute kidney injury (AKI) superimposed on chronic kidney disease was made, likely secondary to intrinsic renal causes.

Upon further assessment, the patient was found to have optimal volume status, no nephrotoxic medications in his medication chart, and sepsis was controlled. Despite this, his creatinine levels continued to rise, reaching 6.5 mg/dL by February 14th, while his potassium levels remained fluctuating. Mild proteinuria was noted, and no edema (anasarca) or refractory hypertension was present.

Extensive workup, including [Antinuclear Antibodies (ANA), Anti-double stranded DNA (anti-dsDNA)

Antineutrophil Cytoplasmic Antibodies (ANCA)], Anti glomerular basement membrane antibodies, C3, C4 and virology , was negative (Table1), while there was no evidence of microangiopathic hemolytic anemia (MAHA) nor thrombocytopenia, which are commonly seen in TMA, the possibility of renal-limited TMA remained a differential diagnosis due to the patient's severe acute kidney injury with proteinuria after administration of Bevacizumab and the absence of alternative explanations for the kidney injury, the patient was planned for a kidney biopsy. However, a biopsy was not possible due to some limitations, specifically, he has elements of coagulopathies with a high risk of bleeding as well as being an uncooperative patient.

Table 1 Immunological, virological, and metabolic laboratory investigations performed as part of the acute kidney injury (AKI) workup. Cytoplasmic Antineutrophil cytoplasmic antibodies-proteinase 3 (C-ANCA-PR3), Perinuclear Antineutrophil cytoplasmic antibodies- microscopic polyangiitis (P-ANCA-MPO), Anti-neutrophilic antibodies (ANA) , Anti-double stranded DNA (Anti-DsDNA)

Labs	Result	Reference range
C-Anca-PR3	0.6	< 20
P-Anca-MPO	0.7	< 20
ANA	1.7	< 20
Anti-DsDNA	9.8	< 27
Complement 3	1.5	0.9–1.8 g/L
Complement 4	0.23	0.1–0.4 g/L
Basal Membrane Abs	< 2	< 7 U/ml
Virology workup	Negative	-
Protein in 24h urine	257	< 150 mg/day
Parathyroid Hormone	656	15–65 pg/ml
Calcium	7.7	8.8–10.2 mg/dl
Serum Albumin	3.1	3.9–4.9 g/dl
Phosphorus	3.7	2.5–4.5 mg/dl
Magnesium	1.49	1.6–2.4 mg/dl

The plan to start him on intravenous Methylprednisolone 150 mg daily for 3 days was taken, at which point his creatinine had reached 9.4 mg/dL, the highest level during his hospitalization. Following steroid administration, his creatinine levels began to trend downward, first to 8.6 mg/dL, and his urine output began to improve. After three days of high-dose steroids, the dose of Methylprednisolone was reduced to 80 mg daily, and his creatinine continued to improve, reaching 6.6 mg/dL and then 4.7 mg/dL.

During his hospitalization, the patient's potassium levels were carefully corrected, and after stabilization, creatinine improved to 3.4 mg/dL. The metabolic acidosis was resolved, and potassium levels were stabilized. The patient was then discharged with a tapering regimen of Prednisolone 40 mg daily, to be gradually reduced by 10 mg every three days over the course of 12 days, with plans for close follow-up in the outpatient clinic. At a follow-up visit two weeks post-discharge, the patient's creatinine was 2.08 mg/dL (Table 2) (Figure 1).

Table 2 Evolution of renal parameters following Bevacizumab infusion and response to pulse steroid administration

	Dates	Creatinine	BUN	Potassium
	11/02/25	1.71		4.4
Date of Bevacizumab Administration	12/02/25	4.53		5.4
	13/02/25	5.48	42	5.1
	14/02/25	6.56	52	
	15/02/25	7.72	60	5.5
	16/02/25	8.35	68	5.5
Date of Pulse Steroid Administration	17/02/25	9.49	108	6
	18/02/25	9.13	100	
	19/02/25	8.64	90	5.9
	20/02/25	7.79	85	5.7
	22/02/25	6.66	88	5.4
	23/02/25	5.58	81	
	24/02/25	4.72	73	5.2
	25/02/25	4.08	70	4.8
	26/02/25	3.4	65	4.7
	07/04/25	2.08		4.2

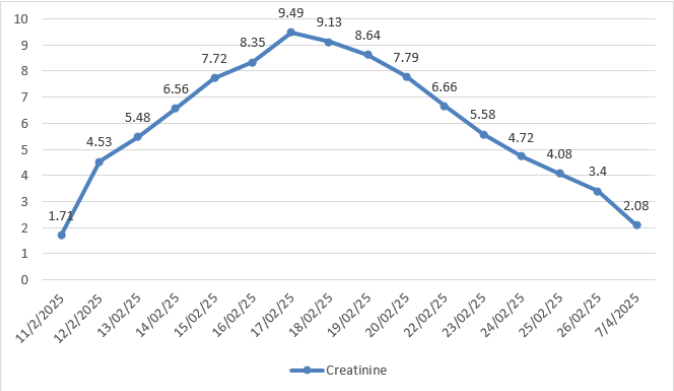

Figure 1 Kidney function monitoring following Bevacizumab infusion and response to pulse steroid administration. Shows improvement of serum creatinine as a biomarker to kidney function.

Discussion

Bevacizumab-induced nephropathy results from the inhibition of vascular endothelial growth factor (VEGF) activity, which is essential for maintaining the structural and functional integrity of the glomerular endothelium and filtration barrier.[8,9] Under physiological conditions, VEGF-A binds to its receptors VEGFR-1 and VEGFR-2, triggering downstream signaling that facilitates nitric oxide (NO) production. This pathway plays a critical role in endothelial-dependent vasodilation, vascular permeability, renal perfusion, and glomerular membrane stability.[10] Bevacizumab, a monoclonal antibody targeting VEGF-A, interferes with this signaling cascade by blocking its interaction with VEGF receptors, ultimately leading to podocyte cytoskeletal disorganization and loss of endothelial fenestrations. These changes contribute to the development of proteinuria and, in some cases, full-blown nephrotic syndrome.[10]

Citation: Bahatheq A, Bajubair AM, Farid AA, et al. Successful judgment-based steroid management of bevacizumab-induced acute kidney injury with suspected renal-limited thrombotic microangiopathy in a patient with colon cancer: a case report. *Urol Nephrol Open Access J.* 2025;13(1):8–10.
DOI: 10.15406/unoaj.2025.13.00362

In our case, the deterioration in renal function occurred shortly after the initiation of bevacizumab, and other common etiologies of acute kidney injury (AKI) Figure 1 in oncology patients were systematically excluded. This temporal relationship supports bevacizumab as the most likely contributor. The nephrotoxic profile of bevacizumab is well-established, with hypertension and proteinuria being the most frequently observed renal adverse effects.

Thrombotic microangiopathy (TMA), in particular, has emerged as the most distinctive renal lesion associated with anti-VEGF therapies, reflecting the critical role of VEGF in maintaining glomerular microvascular integrity.[11]

Clinically, VEGF inhibition is characterized by new-onset or exacerbated hypertension, proteinuria, and predominantly renal-limited TMA. These manifestations often occur with minimal hematologic abnormalities, such as mild anemia or thrombocytopenia. Importantly, case series have demonstrated that these renal complications may be reversible upon discontinuation of the offending agent, with observed improvements in renal function, proteinuria, and blood pressure.[12]

In our patient, a definitive diagnosis could not be confirmed due to limitations in performing a renal biopsy. Although eculizumab has been successfully employed in similar clinical contexts, we were unable to initiate this treatment empirically.[13] This decision was informed by the absence of histologic confirmation and the potential for serious adverse effects, including a significantly increased risk of meningococcal and other invasive infections, infusion-related hypersensitivity reactions, and hematologic or hepatic toxicities.[14]

Given the patient's rapidly progressive renal decline unresponsive to conservative management, high-dose intravenous methylprednisolone was initiated. The patient demonstrated marked clinical and biochemical improvement following steroid therapy.

Acknowledgments

None.

Conflict of interests

The authors declare that there are no conflicts of interest.

Funding

None.

References

1. Qu CY, Zheng Y, Zhou M, et al. Value of bevacizumab in treatment of colorectal cancer: A meta-analysis. *World J Gastroenterol*. 2015;21(16):5072–5080.
2. Garcia J, Hurwitz HI, Sandler AB, et al. Bevacizumab (Avastin®) in cancer treatment: A review of 15 years of clinical experience and future outlook. *Cancer Treat Rev*. 2020;86:102017.
3. Des Guetz G, Uzzan B, Nicolas P, et al. Microvessel density and VEGF expression are prognostic factors in colorectal cancer. Meta-analysis of the literature. *Br J Cancer*. 2006;94(12):1823–1832.
4. Izzedine H, Escudier B, Lhomme C, et al. Kidney diseases associated with anti-vascular endothelial growth factor (VEGF): An 8-year observational study at a single center. *Medicine (Baltimore)*. 2014;93(24):333–339.
5. Fardi Y, Grosser D, Rashidi A. Renal thrombotic microangiopathy from bevacizumab treated with eculizumab: a case report. *SAGE Open Med*. 2024;12:1–6.
6. Usui J, Glezerman IG, Salvatore SP, et al. Clinicopathological spectrum of kidney diseases in cancer patients treated with vascular endothelial growth factor inhibitors: A report of 5 cases and review of literature. *Hum Pathol*. 2014;45(9):1918–1927.
7. Toriu N, Sekine A, Mizuno H, et al. Renal-limited thrombotic microangiopathy due to bevacizumab therapy for metastatic colorectal cancer: a case report. *Case Rep Oncol*. 2019;12(2):391–400.
8. Nihei S, Ikeda T, Aoki T, et al. Plasma endothelin-1 may predict bevacizumab-induced proteinuria in patients with colorectal cancer. *Cancer Chemother Pharmacol*. 2023;91(5):427–434.
9. Tuğcu M, Ataş DB. Causes and results of nephrology consultation in oncological diseases: a single-center experience. *Turk J Nephrol*. 2023;32(3):198–202.
10. Pandey AK, Singhi EK, Arroyo JP, et al. Mechanisms of VEGF-inhibitor associated hypertension and vascular disease. *Hypertension*. 2018;71(2):e1–e8.
11. Izzedine H, Escudier B, Lhomme C, et al. Kidney diseases associated with anti-vascular endothelial growth factor (VEGF): An 8-year observational study at a single center. *Medicine (Baltimore)*. 2014;93(24):333–339.
12. Eremina V, Jefferson JA, Kowalewska J, et al. VEGF inhibition and renal thrombotic microangiopathy. *N Engl J Med*. 2008;358(11):1129–36.
13. Usui J, Glezerman IG, Salvatore SP, et al. Clinicopathological spectrum of kidney diseases in cancer patients treated with vascular endothelial growth factor inhibitors: A report of 5 cases and review of literature. *Hum Pathol*. 2014;45(9):1918–27.
14. Dhanoa RK, Selvaraj R, Shoukrie SI, et al. Eculizumab's unintentional mayhem: a systematic review. *Cureus*. 2022;14(6):e25640.