ISSN 2692-5877
DOI: 10.46998/IJCMCR.2025.57.001414

International Journal of
Clinical Studies & Medical Case Reports

Case Report

Rituximab-Induced Early Onset Myelosuppression in a Patient with Neuromyelitis Optica Spectrum Disorder

Arumugam P, Rajani Gubbala and Mehshar Khan*

Department of critical care and internal medicine, Basavatarakam Indo-American Cancer hospital & research Institute, Hyderabad, Telangana, India

***Corresponding author:** Mehshar Khan, Department of critical care and internal medicine, Basavatarakam Indo-American Cancer hospital & research Institute, Hyderabad, Telangana, India

Received: December 23, 2025 Published: February 16, 2026

Abstract

Rituximab, a monoclonal antibody targeting the CD20 antigen, is used in various autoimmune diseases and hematological malignancies. Although it has a favorable safety profile, serious adverse effects such as anaphylaxis, infections, and myelosuppression are documented.

Rituximab-induced myelosuppression, while rare, can manifest as early-onset (within 4 weeks) or late-onset (after 4 weeks) cytopenias, with the majority being late-onset. Early-onset myelosuppression is exceedingly rare, with few cases reported in the literature.

We report the case of a 27-year-old female with neuromyelitis optica spectrum disorder (NMOSD) who developed grade 4 febrile neutropenia and healthcare-associated pneumonia 10 days after receiving rituximab. Her condition progressed to severe respiratory distress requiring mechanical ventilation and intensive care management, including prone positioning, broad-spectrum antibiotics, G-CSF, and intravenous immunoglobulin. Bone marrow biopsy revealed hypocellularity consistent with rituximab-induced myelosuppression. Following a prolonged and complicated ICU course, the patient underwent tracheostomy, gradually recovered, and was successfully weaned from the ventilator.

Keywords: Rituximab; Early-onset myelosuppression; Febrile neutropenia; NMOSD; Cytopenia

Introduction

Rituximab is a chimeric monoclonal antibody targeting the CD20 antigen on B lymphocytes, leading to their depletion. It is widely used for the treatment of hematological malignancies such as non-Hodgkin's lymphoma and chronic lymphocytic leukemia, as well as autoimmune disorders including systemic lupus erythematosus, rheumatoid arthritis, and neuromyelitis optica spectrum disorder (NMOSD) [1,2]. Despite its broad clinical use and generally favorable safety profile, rituximab has been associated with adverse effects such as infusion reactions, infections, hypogammaglobulinemia, and hematological toxicities including myelosuppression [3].

Rituximab-Associated Neutropenia (RAN) is a recognized but uncommon complication, and it is typically categorized as either late-onset (developing more than four weeks after administration) or early-onset (within four weeks) [4]. Late-onset neutropenia is more frequently reported, while early-onset neutropenia is exceedingly rare, with limited cases documented in the literature. The incidence of myelosuppression following rituximab administration is estimated at approximately 6%, with most cases presenting as late-onset neutropenia [4]. Myelosuppression is also less commonly reported in autoimmune conditions compared to hematologic malignancies [5].

The pathogenesis of rituximab-induced cytopenias remains unclear. Proposed mechanisms include antibody-mediated toxicity, impaired granulopoiesis, abnormal immune reconstitution, and excessive BAFF-mediated B-cell recovery [3,4,6-9]. These hypotheses have primarily been associated with late-onset cases, and the mechanisms underlying early-onset pancytopenia remain poorly defined.

We present a rare case of early-onset rituximab-induced pancytopenia in a patient with NMOSD, complicated by febrile neutropenia, multidrug-resistant pneumonia, and ARDS, requiring intensive care. This report highlights the importance of early recognition and intervention in such high-risk cases. Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Case Report

A 27-year-old woman, previously diagnosed with neuromyelitis optica spectrum disorder (NMOSD) one year prior, was receiving rituximab infusions every six months. She presented to an outside facility with fever and neutropenia 10 days after her last rituximab dose. She was managed initially with antibiotics and supportive care for one week but was referred to our tertiary center due to persistent symptoms and worsening cytopenias.

On admission, her temperature was 100°F, pulse rate 120 bpm, respiratory rate 24/min, and SpO_2 98% on 4 L/min oxygen. Bilateral basal crackles were noted on auscultation; the rest of the physical examination was unremarkable. Laboratory findings revealed pancytopenia, and chest radiograph showed left lower lobe consolidation. Broad-spectrum antimicrobials (meropenem, teicoplanin, posaconazole), blood products, and G-CSF were initiated for suspected healthcare- associated pneumonia. Bone marrow biopsy revealed hypocellular marrow confirming rituximab-induced myelosuppression.

Despite supportive care, her respiratory status deteriorated, requiring mechanical ventilation by day 3. IVIG (60 g total) was administered in view of suspected hypogammaglobulinemia. Blood cultures grew MDR Klebsiella pneumoniae with NDM and OXA-48 resistance; antibiotics were escalated to ceftazidime/avibactam and aztreonam. She developed ARDS and was proned for 18 hours daily from ICU days 5 to 8.

Sputum cultures later revealed MRSA; levonadifloxacin was added. Persistent ventilator dependence prompted tracheostomy on day 9. She developed additional complications including left lung collapse (managed with bronchoscopy), right-sided pneumothorax (requiring ICD), and CLABSI. Cytopenias improved by day 14, and she became afebrile. Nerve conduction studies confirmed critical illness polyneuropathy. She received 2 g/kg IVIG over 5 days and was gradually weaned off the ventilator. She was discharged after 24 days of hospitalization.

Discussion

NMOSD is a rare autoimmune demyelinating disorder affecting the optic nerves and spinal cord. It is associated with anti-aquaporin-4 antibodies and presents with syndromes including optic neuritis, acute myelitis, and area postrema syndrome [1]. Treatment involves acute immunosuppression (e.g., steroids, plasma exchange, IVIG) and long-term agents such as rituximab or azathioprine [2].

Rituximab is commonly well tolerated, but adverse effects like infections, hypogammaglobulinemia, and myelosuppression are documented [3]. Cytopenias are more common in patients treated for hematologic malignancies and are typically late-onset [4,5].

In our patient, cytopenia occurred within 10 days—qualifying as early-onset. While rare, this has been reported in isolated case studies [3,4]. The pathogenesis may involve anti-neutrophil antibodies, disrupted maturation due to B-cell depletion, or abnormal T-cell responses [6-9].

Although many cases of rituximab-associated neutropenia are mild, our patient developed life- threatening sepsis with multidrug-resistant pathogens, requiring intensive care. Management involved timely antimicrobial therapy, G-CSF, IVIG, ventilatory support, and invasive interventions. Patients with high-risk features (e.g., hypogammaglobulinemia, neutropenia, comorbidities) require close monitoring [10]. High-dose IVIG has been reported to rescue cases refractory to G-CSF [11].

Conclusion

Early-onset rituximab-induced myelosuppression is a rare but potentially life-threatening event. This case underscores the importance of close hematological monitoring following rituximab administration, even in patients with autoimmune disorders. Clinicians should be vigilant for febrile neutropenia and initiate early, aggressive therapy including antimicrobials, G-CSF, and IVIG when indicated.

Further research is essential to understand the pathogenesis and to establish standard management protocols for rituximab-associated cytopenias.

References

1. Shumway CL, Patel BC, Tripathy K, et al. Neuromyelitis Optica Spectrum Disorder (NMOSD) [Updated 2024 Jan 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing, 2025.
2. Barnett Y, Sutton IJ, Ghadiri M, Masters L, Zivadinov R, Barnett MH. Conventional and advanced imaging in neuromyelitis optica. AJNR Am J Neuroradiol, 2014; 35(8): 1458-1466.
3. Arroyo-Avila M, Fred-Jimenez RM, Vila LM. Early-onset neutropenia induced by rituximab in a patient with lupus nephritis and hemolytic anemia. Case Rep Rheumatol, 2015; 2015: 616787.
4. Weissmann-Brenner A, Brenner B, Belyaeva I, Lahav M, Rabizadeh E. Rituximab- associated neutropenia: description of three cases and an insight into the underlying pathogenesis. Med Sci Monit, 2011; 17(11): CS133-137.
5. Tesfa D, Ajeganova S, Hägglund H, Sander B, Fadeel B, Hafström I, et al. Late-onset neutropenia following rituximab therapy in rheumatic diseases: association with B lymphocyte depletion and infections. Arthritis Rheum, 2011; 63(8): 2209-2214.
6. Otrock ZK, Mahfouz RA, Oghlakian GO, Salem ZM, Bazarbachi A. Rituximab-induced acute thrombocytopenia: a report of two cases. Haematologica, 2005; 90(Suppl): ECR23.
7. Voog E, Morschhauser F, Solal-Céligny P. Neutropenia in patients treated with rituximab. N Engl J Med, 2003; 348: 2691-2694.
8. Fukuno K, Tsurumi H, Ando N, Oyake T, Yamada T, Kanemura N, et al. Late-onset neutropenia in patients treated with rituximab for non-Hodgkin's lymphoma. Int J Hematol, 2006; 84(3): 242-247.
9. Terrier B, Ittah M, Tourneur L, Louache F, Green DR, Mariette X. Late-onset neutropenia following rituximab results from a hematopoietic lineage competition due to an excessive BAFF-induced B-cell recovery. Haematologica, 2007; 92(5): e20-23.
10. Freifeld AG, Bow EJ, Sepkowitz KA, Boeckh MJ, Ito JI, Mullen CA, et al. Clinical practice guideline for the use of antimicrobial agents in neutropenic patients with cancer: 2010 update by the Infectious Diseases Society of America. Clin Infect Dis, 2011; 52(4): e56-93.
11. Diez-Feijóo R, Rodríguez-Sevilla JJ, Fernández-Rodríguez C, Navarrete M, Muñoz A, Calviño J, et al. High doses of intravenous immunoglobulins as a successful treatment for late-onset immune agranulocytosis after rituximab plus bendamustine. Eur J Haematol, 2020; 105(2): 235-239.

Citation: Arumugam P, Rajani Gubbala and Mehshar Khan*. Rituximab-Induced Early Onset Myelosuppression in a Patient with Neuromyelitis Optica Spectrum Disorder. *IJCMCR. 2025; 57(3): 004*

DOI: *10.46998/IJCMCR.2025.57.001414*