

Parvovirus-induced pancytopenia in chronic kidney disease: a diagnostic challenge

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Pancytopenia results from diverse underlying conditions. Parvovirus B19 can directly suppress bone marrow and mimic sepsis or drug-induced cytopenia. We report a patient with chronic kidney disease, predialysis, and managed conservatively, who presented with fever and pyelonephritis. Methotrexate use for arthritis initially suggested drug toxicity, but bone marrow aspiration and biopsy revealed features consistent with parvovirus infection, later confirmed by molecular testing. This case highlights the importance of early bone marrow aspirate and biopsy in considering parvovirus B19 in unexplained pancytopenia, thereby enabling timely diagnosis.

Keywords:

bone marrow cytology and histology, chronic kidney disease, intravenous immunoglobulin, Pancytopenia, Parvovirus B19, polymerase chain reaction

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Introduction

Pancytopenia represents a complex clinical problem with diverse aetiologies, ranging from marrow suppression to systemic illness. Among viral causes, Parvovirus B19 is notable for its ability to directly inhibit erythroid precursors, thereby mimicking sepsis or drug-induced cytopenia. Patients with chronic kidney disease are particularly vulnerable, as immunosuppression and comorbid therapies may obscure the underlying diagnosis. Early recognition through bone marrow aspiration and biopsy is essential, since timely identification of parvovirus infection can guide appropriate management and prevent unnecessary interventions [1].

Case report

A 34-year-old man with chronic kidney disease (CKD) presented to the emergency department with 6 days of fever, itching, and abdominal pain, which was subsequently attributed to upper urinary tract involvement consistent with pyelonephritis. Investigations at another hospital had shown pancytopenia with raised blood urea and creatinine. He had been receiving methotrexate for joint pains for 6 months and had a history of recurrent urinary tract infections. With infection or drug-related marrow suppression suspected, he was referred for further evaluation.

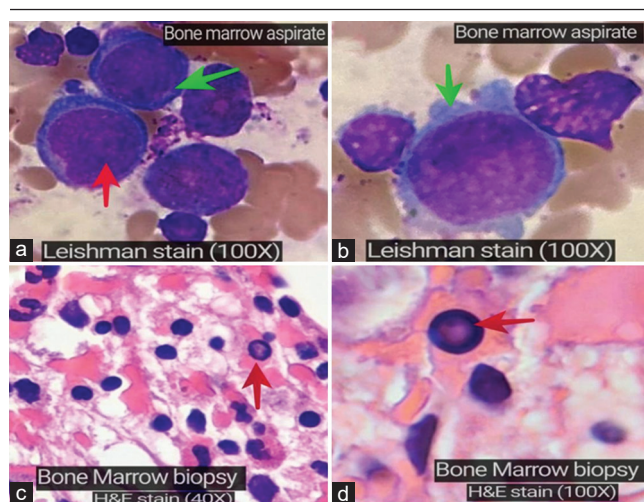
Initial laboratory results revealed hemoglobin 6.8 g/dl, total leucocyte count 430 cells/cu mm, and platelet count 20,000/ μ L. The erythrocyte sedimentation rate was raised at 80 mm in the first hour, and the

reticulocyte count was low at 0.2%. The coagulation profile was normal. Biochemical parameters showed total bilirubin 2.0 mg/dl (indirect fraction 1.7 mg/dl), serum creatinine 4.8 mg/dl (estimated glomerular filtration rate $\approx$ 18 ml/min/1.73 m², CKD stage 4–5), blood urea 88 mg/dl and uric acid 9.5 mg/dl. Serum lactate dehydrogenase, vitamin B12 and folate were within normal limits. Procalcitonin was elevated at 7.9 ng/ml. Serological tests for malaria, leptospira, brucella and scrub typhus were negative. Viral markers for hepatitis B, hepatitis C, and HIV were nonreactive. The autoimmune workup was also negative.

Bone marrow aspiration and biopsy performed in the emergency department revealed a hypocellular marrow with few pronormoblasts and giant erythroblasts showing large nuclei and deeply basophilic cytoplasm (Fig. 1a, b, green arrow). Some cells demonstrated folded nuclear margins with a 'dogear' appearance (Fig. 1b), while bone marrow biopsy showed prominent intranuclear inclusions (Fig. 1c and 1d) (red arrow), findings suggestive of Parvovirus B19 infection. PCR in the peripheral blood sample confirmed parvovirus B19 DNA. Blood and urine cultures were sterile. The patient was managed jointly by the nephrology and urology teams with intravenous immunoglobulin (IVIG, 0.4 g/kg/day for 5 days, dose adjusted for renal function) and discontinuation of methotrexate and supportive

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Figure 1



Parvovirus B19 – related cytopathic findings. a: Bone marrow aspirate (Leishman stain) showing a pronormoblast with deep basophilic cytoplasm (green arrow) and intranuclear inclusions (red arrow). b: Giant proerythroblast with folded nuclear margin producing a bilobed or dog ear appearance (green arrow). c and d: Bone marrow biopsy sections (Hematoxylin & Eosin stain) demonstrating giant pronormoblasts (c, red arrow) with prominent intranuclear inclusions (d, red arrow).

transfusions. Pancytopenia gradually resolved, platelet and leucocyte counts improved and fever subsided.

Discussion

Parvovirus B19 is a small, single-stranded DNA virus that targets erythroid progenitor cells in the bone marrow. It inhibits erythroid maturation by binding to the P antigen, which can result in pure red cell aplasia or in severe cases, pancytopenia often mimicking sepsis, drug-induced marrow suppression or aplastic anemia [2].

In chronic kidney disease, Parvovirus B19 infection may coexist with bacterial or viral illness, causing diagnostic confusion. Active infection is uncommon (1–5%) but risk increases with dialysis and therapies such as methotrexate [3]. Parvovirus B19 is diagnostically challenging in CKD because Immunoglobulin M (IgM) serology is unreliable; uraemia impairs antibody response, making PCR the preferred test [4]. In this case, procalcitonin was markedly elevated at 7.9 ng/ml, which usually suggests bacterial sepsis; however, cultures were sterile, highlighting a pitfall because parvovirus can raise procalcitonin levels and CKD patients often have higher baseline levels [5]. Beyond pancytopenia, parvovirus B19 is a recognized cause of Erythropoietin (EPO)-resistant anemia in dialysis and advanced CKD, underscoring its clinical relevance. Methotrexate use further increased susceptibility by impairing T-cell clearance and immune control of

viral replication [6]. Bone marrow findings of giant proerythroblasts with intranuclear inclusions are characteristic and PCR confirmation is diagnostic [7].

Conclusion

Parvovirus B19 can masquerade as infection or drug-induced marrow suppression in chronic kidney disease, complicating diagnosis. Bone marrow evaluation and PCR confirmation remain pivotal for timely recognition. Awareness of this viral cause of pancytopenia ensures appropriate therapy, avoids unnecessary interventions and highlights vigilance in immunocompromised patients.

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Disclaimer: Appropriate informed consent was taken from the patients attendant to publish the report.

Patient declaration of consent statement: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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