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Peripheral Hemophagocytosis and Leukemic Blasts from Urine in *de novo* Pure Erythroid Leukemia

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A 46-year-old male patient with a history of hypertension for 4-5 years was admitted complaining bleeding gums and general fatigue for 7 days. A complete blood count showed white blood cell count, 47.95×10^9/L, hemoglobin concentration, 55 g/L and platelet 11×10^9/L. Bone marrow (BM) aspiration showed 81% immature cells with the features of proerythroblasts. Immunophenotyping analysis demonstrated the blast population was positive for CD36, CD105, CD33, CD117, CD13, CD71, CD34, HLA-DR and CD38. Besides, BM biopsy indicated sheets of blasts and E-cadherin was positive on immunohistochemistry. Cytogenetics showed complex karyotype with 52,XY,-4,-5,add(5)(q13),+14,add(15)(p11.2),-16,+19,add(19)(p13.1),add(19) (p13.1),-21,+mar1~8[10]. Next-generation sequencing detected TP53 mutation with a median variant allele frequency of 58%. A final diagnosis of pure erythroid leukemia (PEL) was made. The patient underwent chemotherapy with DA (daunorubicin, 60mg d1-3+ cytosine arabinoside, 0.1g, q12h, d1-7), and then cytarabine 38mg d1-5 and another course of DA chemotherapy of daunorubicin, 60mg d1-3+cytosine arabinoside, 0.15g, qd d1-7, but never received remission, and rapidly progressed to multiorgan failure and macroscopic hematuria 77 days after initial admission. Peripheral blood smears revealed numerous blasts, as well as hemophagocytes phagocytizing neutrophils, eosinophils, platelets, erythrocytes and proerythroblasts (Fig. 1a-c). Notably, urinalysis showed the cell count was 392.98 /μl (reference range: 0-17/μl) and

urine cytology was performed, leukemic blasts were also noted in this urine specimen with morphological features consistent with the peripheral blood smears (Fig. 1d). Besieds, the results of urinalysis before the chemotherapy were normal and there was no leukocyte in the urine. Imaging of kidney and bladder showed no significant abnormalities, which ruled out the renal or bladder involvement of leukemia. Hence, the patient's hematuria is most likely due to the severe thrombocytopenia. Additional laboratory tests supporting for the hemophagocytic syndrome (HLH) were within normal reference values. Moreover, blood cultures of both aerobic and anaerobic bacteria were all negative for several times throughout the whole clinical course, ruling out the hemophagocytosis secondary to sepsis. Unfortunately, he died of myelosuppression, respiratory failure, liver and kidney dysfunction, gastrointestinal bleeding, and coagulation dysfunction within three months from the initial presentation.

The presence of peripheral hemophagocytosis, as an important laboratory indicator for the diagnosis of sepsis or secondary HLH, was quite rare in de novo PEL cases. As is well-known, urothelial carcinoma is the most common tumor encountered in exfoliative urine cytology.[1] Leukemic invasion of the genitourinary system is a very rare event, it may occur due to the bladder infiltration with blast cells or as a result of hemorrhage in the urinary bladder caused by thrombocytopenia, and contamination of the urine with leukemic blasts attributable to an increased peripheral blast count.[1,2] Leukemic cells were found by accident for the routine urinalysis by microscopic examination in this patient. Herein, the present case with concurrence of peripheral hemophagocytosis and leukaemic blasts in urine specimen in de novo PEL was even more extremely uncommon. This case highlights the value of morphological method providing a simple, fast, and cost-effective approach for the detection of peripheral hemophagocytosis and leukemic blasts in a urine specimen.

Keywords: Peripheral hemophagocytosis, leukemic blasts, urine specimen, de novo pure erythroid leukemia

Declarations

Conflicts of interest

Authors of this manuscript declare that no one has conflict of interest to disclose.

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None.

Authors contribution

YT, XL and FH made the differential diagnosis, guided the patient’s treatment, and wrote this Clinical Picture. MY, LZ and JL participated in the clinical diagnosis, analysed the clinical records, and wrote the main text. XL and MY guided the clinical diagnosis, revised this Clinical Picture, and assisted in preparing this case for publication.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

Data availability statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Informed consent Informed consent was obtained from this patient.

Ethical approval All procedures performed in the study involving human participants were in

accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent for publication Informed consent was obtained from the publication.

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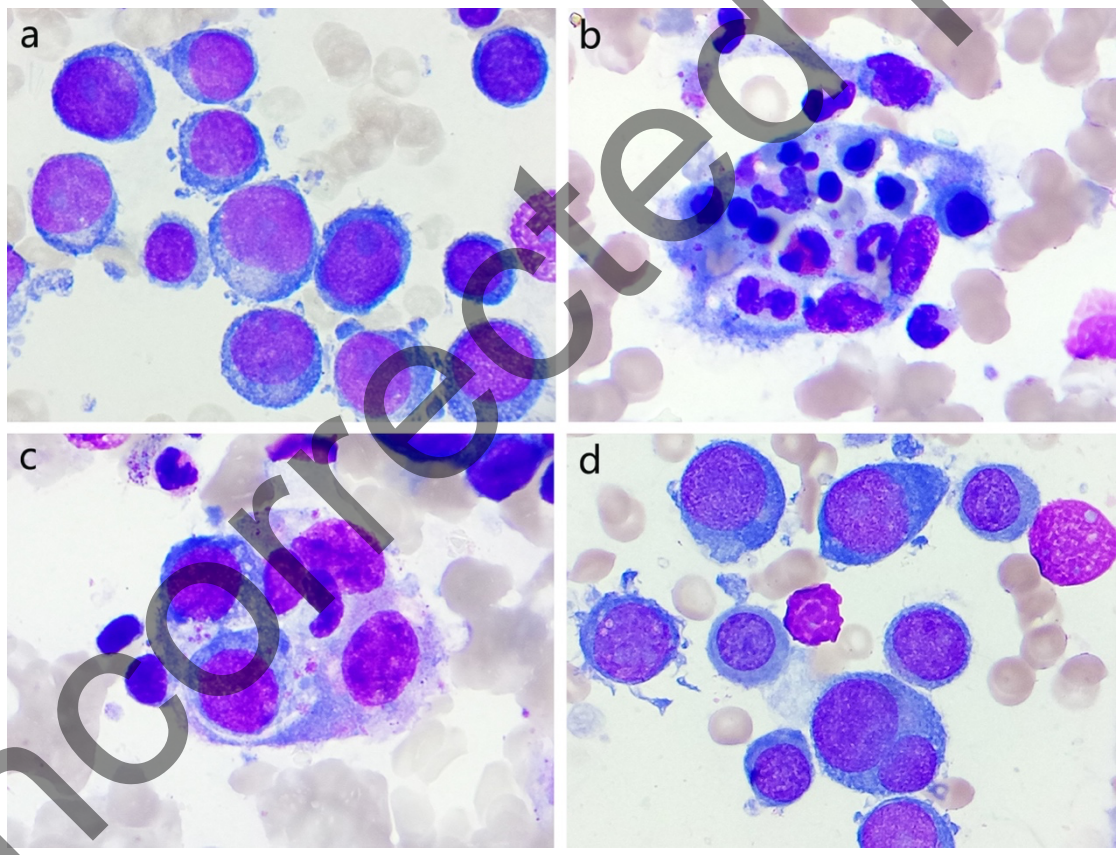

Figure 1. Peripheral blood smears revealed numerous blasts, as well as hemophagocytes phagocytizing neutrophils, eosinophils, platelets, erythrocytes and proerythroblasts (a-c, ×1000, Wright-Giemsa staining). Urine smears showed leukemic blasts with morphological features consistent with the peripheral blood smears (d, ×1000, Wright-Giemsa staining).