

Case Report

Hyperleukocytic Classic Hairy Cell Leukemia with Trisomy 8 and *BRAF* V600E Mutation: A Case Report and Review of the LiteratureA. Yahyaoui^{1,2*} , F. Ousti², A. Natiq², J. Elbakkouri², Y. Bamou²¹Hematology Laboratory, Military Hospital Mohamed V Rabat Morocco²National Laboratory Mohamed VI Casablanca Morocco

Article History

Received: 21.08.2026

Accepted: 24.10.2026

Published: 28.10.2026

Journal homepage:

<https://www.easpublisher.com>

Quick Response Code



Abstract: Background: Classic hairy cell leukemia (HCL) typically presents with pancytopenia, monocytopenia, and splenomegaly; leukocytosis is uncommon and usually moderate. Cytogenetic abnormalities are infrequent, and trisomy 8 has rarely been reported. **Case presentation:** A 49-year-old man presented with progressive asthenia, pallor, epistaxis, gingival bleeding, and abdominal discomfort. Examination revealed massive splenomegaly. The complete blood count showed leukocytosis ($41 \times 10^9/L$), anemia (hemoglobin 10.3 g/dL), and thrombocytopenia ($43 \times 10^9/L$). The blood smear showed 77% small-to-medium-sized lymphoid cells with villous cytoplasmic projections, 19% lymphocytes, 4% neutrophils, and absolute monocytopenia (0%). Bone marrow aspiration was difficult (tendency to dry tap) and showed 83% infiltration by hairy cells. Flow cytometry identified a clonal B-cell population (CD19+, CD20+, FMC7+, CD10+, CD5-, CD23-, CD79b-, weak kappa) coexpressing CD25, CD103, and CD123. A heterozygous *BRAF* V600E mutation was detected. Karyotyping showed trisomy 8 in 20/20 metaphases. **Conclusion:** This case illustrates an uncommon hyperleukocytic presentation of classic HCL, with CD10 expression and trisomy 8, a combination that may mimic HCL variant or other splenic B-cell lymphomas. Integrated morphological, immunophenotypic, and molecular assessment, notably *BRAF* V600E testing, remains decisive for diagnosis and treatment choice.

Keywords: Hairy Cell Leukemia, Hyperleukocytosis, Trisomy 8, *BRAF* V600E, Splenomegaly, CD10.

Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Hairy cell leukemia (HCL) is a rare, indolent B-cell lymphoproliferative disorder, accounting for approximately 2% of adult leukemias, with a marked male predominance and a median age at diagnosis of around 55 years [1].

The classic presentation combines cytopenias (pancytopenia or bicytopenia), almost constant monocytopenia, and splenomegaly. Leukocytosis is atypical: it is most often absent or moderate, and its presence raises the possibility of the variant form.

The *BRAF* V600E mutation, present in almost all cases of classic HCL, is the founding genetic event of the disease. It has transformed the differential diagnosis and paved the way for targeted therapies [2].

Cytogenetic abnormalities may occur but are uncommon. Isolated trisomy 8 is not a recurrent abnormality in HCL. Here, we report a case of hyperleukocytic classic HCL, *BRAF* V600E-positive and CD10 positive, with trisomy 8, and we discuss its diagnostic and therapeutic implications.

CASE PRESENTATION

Clinical History: A 49-year-old man with no significant medical history was admitted for asthenia, pallor, unquantified weight loss, intermittent fever, epistaxis, gingival bleeding, and abdominal discomfort that had worsened progressively over a few weeks.

Physical Examination: Examination revealed massive splenomegaly (20 cm below the costal margin) and mild hepatomegaly, without peripheral lymphadenopathy.

Laboratory Findings: Complete Blood Count

The complete blood count and differential at diagnosis are presented in Table 1.

Table 1: Complete blood count and differential at diagnosis

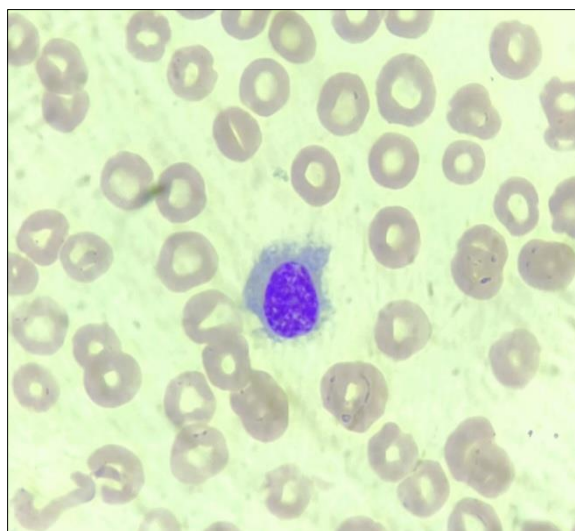
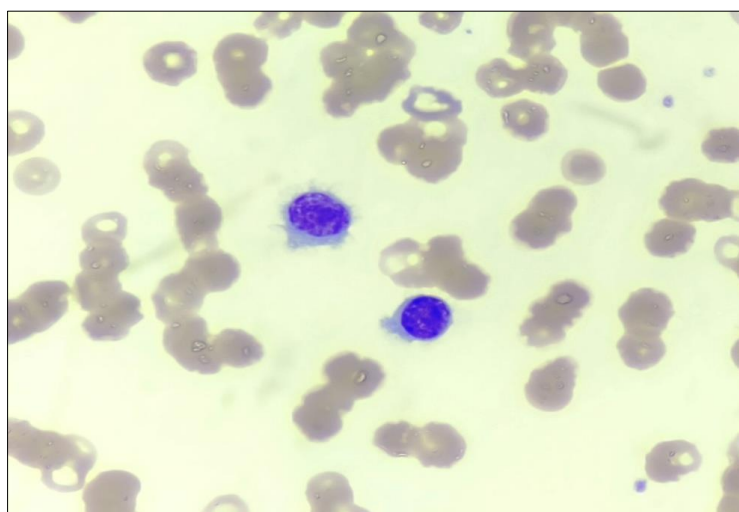
Parameter	Result	Comment
Leukocytes	$41 \times 10^9/L$	Hyperleukocytosis
Hemoglobin	10.3 g/dL	Moderate anemia
Platelets	$43 \times 10^9/L$	Thrombocytopenia, accounting for the mucosal bleeding
Hairy cells	77% ($\approx 31.6 \times 10^9/L$)	
Lymphocytes	19% ($\approx 7.8 \times 10^9/L$)	
Neutrophils	4% ($\approx 1.6 \times 10^9/L$)	Relative neutropenia; absolute neutrophil count borderline
Monocytes	0%	Characteristic monocytopenia

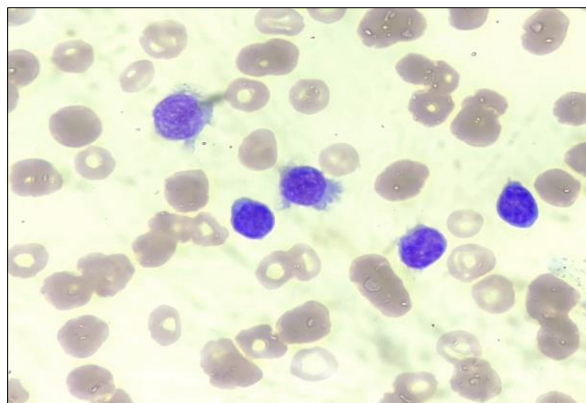
Cytology (Figs. 1–3)

Peripheral blood smear. The smear showed 77% lymphoid cells of small to medium size, with a high nuclear-to-cytoplasmic ratio (0.7–0.9) and round nuclei with dense chromatin. The cytoplasm was variably abundant, weakly basophilic, and devoid of granules, and displayed fine cytoplasmic projections (“hairy” appearance) suggestive of hairy cells. The residual

differential count comprised 19% mature lymphocytes, 4% neutrophils, and 0% monocytes, a major feature pointing toward HCL.

Bone marrow aspirate. Aspiration was technically difficult owing to reticulin fibrosis and showed massive marrow infiltration, estimated at 83% hairy cells.

**Figures 1: MGG-stained blood smear (x1000) showing a Hairy cell****Figures 2: MGG-stained blood smear (x1000) showing Hairy cells**



Figures 3: MGG-stained Blood Smear (x1000) showing Hairy cells

Immunophenotyping of Whole Blood (Figs. 4–6)

Flow cytometry identified a clonal B-cell population with the following profile: strong CD45, CD19+, bright CD20, FMC7+, CD10+, CD5–, CD23–, CD79b–, and weak kappa light-chain restriction. The

hairy cell markers CD25, CD103, and CD123 were all positive, yielding a Matutes HCL score (CD11c, CD25, CD103, CD123) of 3/3 on the available markers, which is highly suggestive of classic HCL [3].

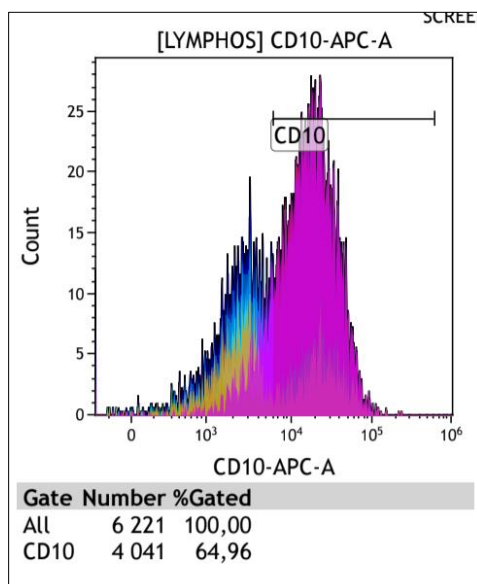


Figure 4: CMF: showing CD10+

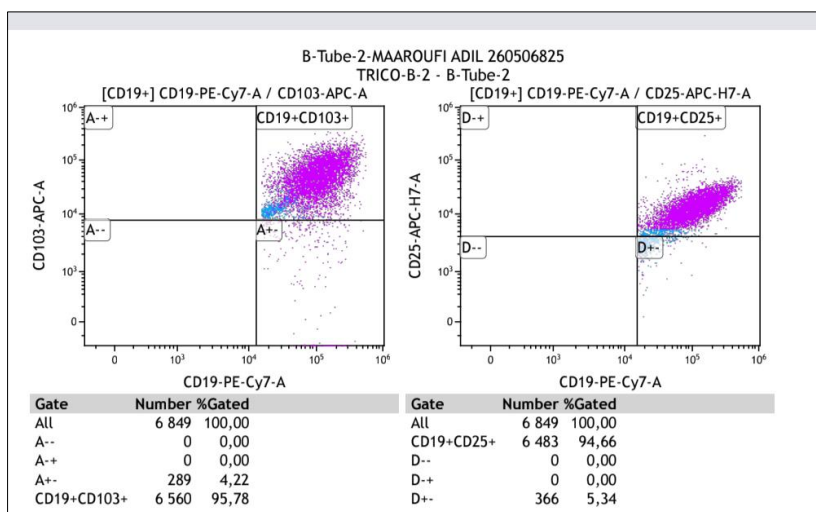


Figure 5: CMF: Showing CD19+/CD103+ and CD19/CD25+

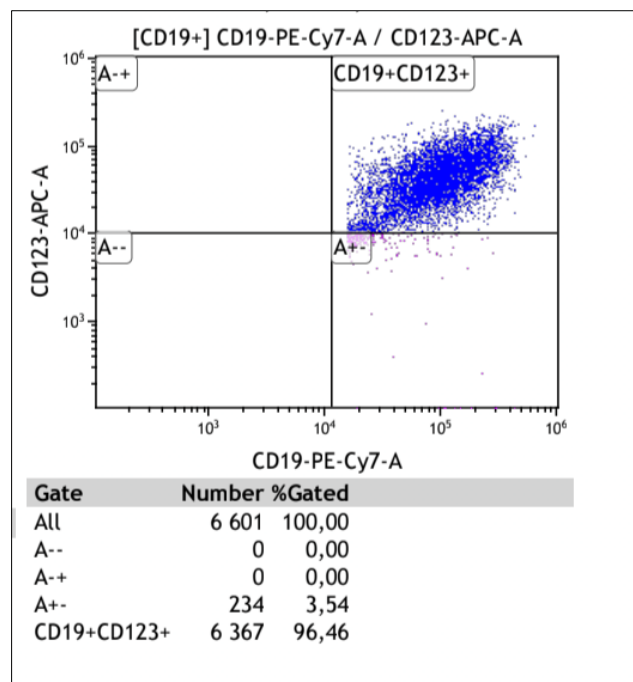


Figure 6: CMF showing CD19+/CD123+

Molecular Biology and Cytogenetics

A heterozygous *BRAF* V600E mutation was detected by Real-Time PCR.

Conventional karyotyping (Fig. 7), performed after stimulation with DSP30 and interleukin-2, with R-banding obtained by heat denaturation, showed trisomy 8 in 20/20 metaphases, corresponding to the karyotype 47, XY,+8[20].

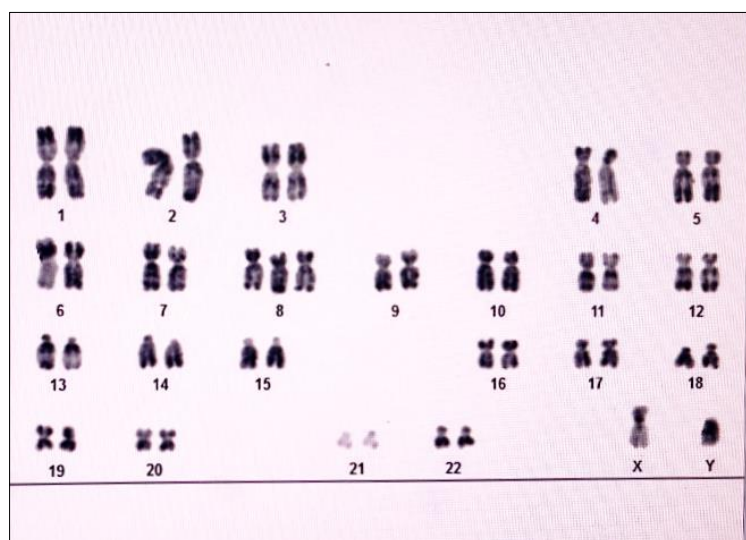


Figure 7: R-banding Karyotype: 47, XY, +8

DISCUSSION

A Well-Supported Diagnosis of Classic HCL

Several findings converge toward this diagnosis: a splenic tumor syndrome with cytopenias, monocytopenia, hairy cell morphology, bone marrow infiltration, a CD25+/CD103+/CD123+ profile and, above all, the *BRAF* V600E mutation, which points to the classic form. This mutation is absent in HCL variant

(now designated splenic B-cell lymphoma/leukemia with prominent nucleoli [SBLPN] in the 2022 WHO classification, and regarded as a distinct entity in the International Consensus Classification [ICC]) and in most cases of splenic marginal zone lymphoma [2-5].

Differential Diagnosis of the Hyperleukocytic Form

The main differential diagnoses of a hyperleukocytic presentation are summarized in Table 2.

Table 2: Differential diagnosis of hyperleukocytic classic HCL

Entity	Arguments for or against in this case
HCL variant / SBLPN	Monocytes usually preserved, prominent nucleolus, CD25 ⁺ , CD123 ⁺ , <i>BRAF</i> wild-type. Against in this case
Splenic marginal zone lymphoma	CD103 rare, CD25 and CD123 weak or negative, <i>BRAF</i> wild-type. Against
Splenic diffuse red pulp lymphoma	CD25 ⁺ , CD123 ⁺ , variable CD103, villous cells without abundant cytoplasm. Against
Atypical CLL	CD5 ⁺ , CD23 ⁺ , CD200 ⁺ , weak CD79b. Against (CD5 ⁺ , CD23 ⁺)
Leukemic mantle cell lymphoma	Usually CD5 ⁺ , cyclin D1/t(11;14). To be excluded if in doubt (CD5 ⁺ cases are rare)
B-cell prolymphocytic leukemia	Prolymphocytes > 55%, distinct nucleolus. Against

HCL, hairy cell leukemia; SBLPN, splenic B-cell lymphoma/leukemia with prominent nucleoli; CLL, chronic lymphocytic leukemia.

A noteworthy point is that CD10, usually negative, is expressed by a minority of classic HCL cases (in the order of 10–20% depending on the series). Its expression, combined with hyperleukocytosis, may wrongly suggest HCL variant or leukemic follicular lymphoma; the *BRAF* V600E mutation resolves the doubt [3, 4].

Hyperleukocytosis in HCL

Overt leukocytosis ($> 30\text{--}50 \times 10^9/\text{L}$) is rare in HCL and is often correlated with a high tumor burden and massive splenomegaly. From a practical standpoint, hyperleukocytosis raises issues of infectious risk, tumor lysis risk (low but possible with purine analogues), and therapeutic choice.

Trisomy 8

Chromosomal abnormalities are reported in a minority of HCL cases. The most frequent are trisomy 5, rearrangements of 14q and 7q, and abnormalities of 6q or 17p; trisomy 8 is rare and has no established prognostic value [6].

Trisomy 8, isolated or within complex rearrangements, is an unusual finding in HCL. In hematologic oncology, trisomy 8 is a recurrent marker of aggressive clonal proliferation (notably observed in myelodysplastic syndromes and acute myeloid leukemias). Its prognostic impact in HCL remains debated owing to the rarity of reported cases, but it is often correlated with a high tumor burden, bulky splenomegaly, and potential resistance to conventional therapeutic regimens [7-9].

Current Management

The management of HCL has been profoundly transformed over recent decades.

Purine analogues. Cladribine (2-CdA) and pentostatin have historically been the reference first-line treatment, achieving high and durable complete remission rates [1-5].

Targeted immunotherapy. The addition of the anti-CD20 monoclonal antibody rituximab has proved particularly useful in relapsed or aggressive/atypical forms to eliminate minimal residual disease [1].

Oral targeted therapies. The advent of *BRAF* inhibitors (such as vemurafenib) has opened new therapeutic perspectives, notably for patients refractory to purine analogues or with particular molecular profiles [10].

CONCLUSION

Hyperleukocytosis does not exclude classic HCL; the absence of monocytes, the CD25/CD103/CD123 profile, and the *BRAF* V600E mutation are decisive.

CD10 expression is possible in classic HCL and should not lead to a misdiagnosis of follicular lymphoma or HCL variant.

Hyperleukocytic HCL associated with trisomy 8 is a rare clinicobiological presentation combining a high tumor burden and an atypical cytogenetic profile. The combined identification of monocytopenia, specific phenotypic markers, and the *BRAF* V600E mutation remains indispensable for establishing a precise diagnosis and excluding differential diagnoses. Close cytogenetic and molecular monitoring is warranted in these patients to best adapt modern therapeutic strategies.

REFERENCES

- Grever MR, et al (2017) Consensus guidelines for the diagnosis and management of patients with classic hairy cell leukemia. *Blood* 129:553–560
- Tiacci E, et al (2011) *BRAF* mutations in hairy-cell leukemia. *N Engl J Med* 364:2305–2315
- Matutes E, et al (2001) The immunophenotype of hairy cell leukemia and the proposal of a scoring system. *Leukemia* 15:184–186
- Alaggio R, et al (2022) The 5th edition of the WHO Classification of Haematolymphoid Tumours: Lymphoid Neoplasms. *Leukemia* 36:1720–1748

5. Robak T, et al (2015) Hairy cell leukaemia: ESMO Clinical Practice Guidelines. *Ann Oncol* 26(Suppl 5):v100–v107
6. Haglund U. et al. (1994) — "*Hairy cell leukemia is characterized by clonal chromosome abnormalities clustered to specific regions.*" *Blood*, 83(9):2637-2645
7. Grimwade D. et al. (1998 & mises à jour ultérieures) — *The Medical Research Council (MRC) Adult Leukaemia Working Party*. Travaux de référence fondateurs sur la classification pronostique des anomalies cytogénétiques dans les LAM (plaçant la trisomie 8 isolée dans le groupe intermédiaire). *Blood*.
8. Atlas of Genetics and Cytogenetics in Oncology and Haematology — Fiche technique thématique : "+8 or trisomy 8". Synthèse détaillée sur la fréquence, les maladies associées et l'épidémiologie de la trisomie 8 en onco-hématologie.
9. Schoch C. et al. (2001) — "*Trisomy 8 is the most common numerical aberration in acute myeloid leukemia...*" Études portant sur les caractéristiques cliniques et cytogénétiques de grandes cohortes de patients présentant une LAM avec trisomie 8.
10. Tiacci E, et al (2015) Targeting mutant *BRAF* in relapsed or refractory hairy-cell leukemia. *N Engl J Med* 373:1733–1747

Cite This Article: Yahyaoui, A., Ousti, F., Natiq, A., Elbakkouri, J., & Bamou, Y. (2026). Hyperleukocytic Classic Hairy Cell Leukemia with Trisomy 8 and BRAF V600E Mutation: A Case Report and Review of the Literature. *EAS J Biotechnol Genet*, 8(4), 78-83. <https://doi.org/10.36349/easjbg.2026.v08i04.003>
