

## Visual Clues in Ocular Involvement of Acute Promyelocytic Leukemia

García-Risco R. et al.: Ocular Involvement of Acute Promyelocytic Leukemia

Rocío García-Risco, Paula García-Valentín, Marc Tort-Lacambra, Cristina Parés-Alfonso, Alba Jordán-Gascón, Tetiana Goncharova Simón, Elena Ros-Sánchez

Hospital Universitari Vall d'Hebron, Clinic of Ophthalmology, Barcelona, Spain

Rocío García-Risco, M.D., Hospital Universitari Vall d'Hebron, Clinic of Ophthalmology, Barcelona, Spain

[rocio.garcia@vallhebron.cat](mailto:rocio.garcia@vallhebron.cat)

<https://orcid.org/0009-0009-4781-9965>

January 1, 2026

April 3, 2026

A 65-year-old woman presented with blurry vision accompanied by severe anemia (hemoglobin 6.2 g/dL) and thrombocytopenia ( $13 \times 10^3/\mu\text{L}$ ). The leukocyte count at diagnosis was  $4.21 \times 10^3/\mu\text{L}$ , without evidence of hyperleukocytosis. Laboratory evaluation revealed low fibrinogen (1.4 g/L), markedly elevated D-dimer levels (18,020 ng/mL), and prolonged prothrombin time (PT). According to the International Society on Thrombosis and Haemostasis criteria, the calculated disseminated intravascular coagulation (DIC) score was 6 points (platelet count  $<50 \times 10^3/\mu\text{L}$  = 2 points; markedly elevated D-dimer = 3 points; prolonged PT = 1 point; fibrinogen  $>1.0$  g/L = 0 points), consistent with overt DIC at diagnosis. The patient required transfusion support with 2 units of packed red blood cells, 2 platelet pools, and 1g of fibrinogen concentrate.

Peripheral blood smear showed 40% promyelocytes and blasts. Bone marrow aspirate revealed 86% pathological cells with an atypical promyelocytic immunophenotype. Flow cytometry demonstrated positivity for CD45 and myeloperoxidase (90%), strong CD33, heterogeneous CD13, CD38 positivity, and weak expression of CD117 (82%) and CD123 (46%), with absence of CD34, HLA-DR, TdT, and CD15. Molecular analysis confirmed PML-RARA transcripts (BCR1, BCR2, BCR3), establishing the diagnosis of acute promyelocytic leukemia. Induction therapy with all-trans retinoic acid and mitoxantrone was initiated.

Ophthalmologic evaluation revealed bilateral peripapillary flame-shaped hemorrhages, dot-and-blot peripheral hemorrhages, and Roth spots (Figure 1), consistent with leukemic retinopathy and optic neuropathy (LRON)<sup>1</sup>.

Although ophthalmic complications are often underrecognized, studies report ocular involvement in 32–35.5% of acute leukemia patients, the retina being the most frequently affected site.<sup>1</sup> Ocular manifestations in leukemia can arise from direct leukemic infiltration, secondary central nervous system involvement, or retinal vascular abnormalities related to anemia, thrombocytopenia, leukemic infiltration, hyperviscosity, or DIC.<sup>1,2,3</sup> Roth spots, while historically associated with subacute bacterial endocarditis, may also result from platelet-fibrin aggregation and leukemic cell accumulation.<sup>4,5,6</sup> DIC can affect the eye at various stages, typically causing retinal detachments, vacuolar disruption of the retinal pigment epithelium, choroidal hemorrhages, and thrombotic occlusion of the choriocapillaris and adjacent submacular and peripapillary vessels.<sup>7,8</sup> Although the patient was initially at high risk for DIC, her retinal findings did not match typical DIC-related ocular changes, suggesting that thrombocytopenia, anemia, or direct leukemic involvement were the main contributors.

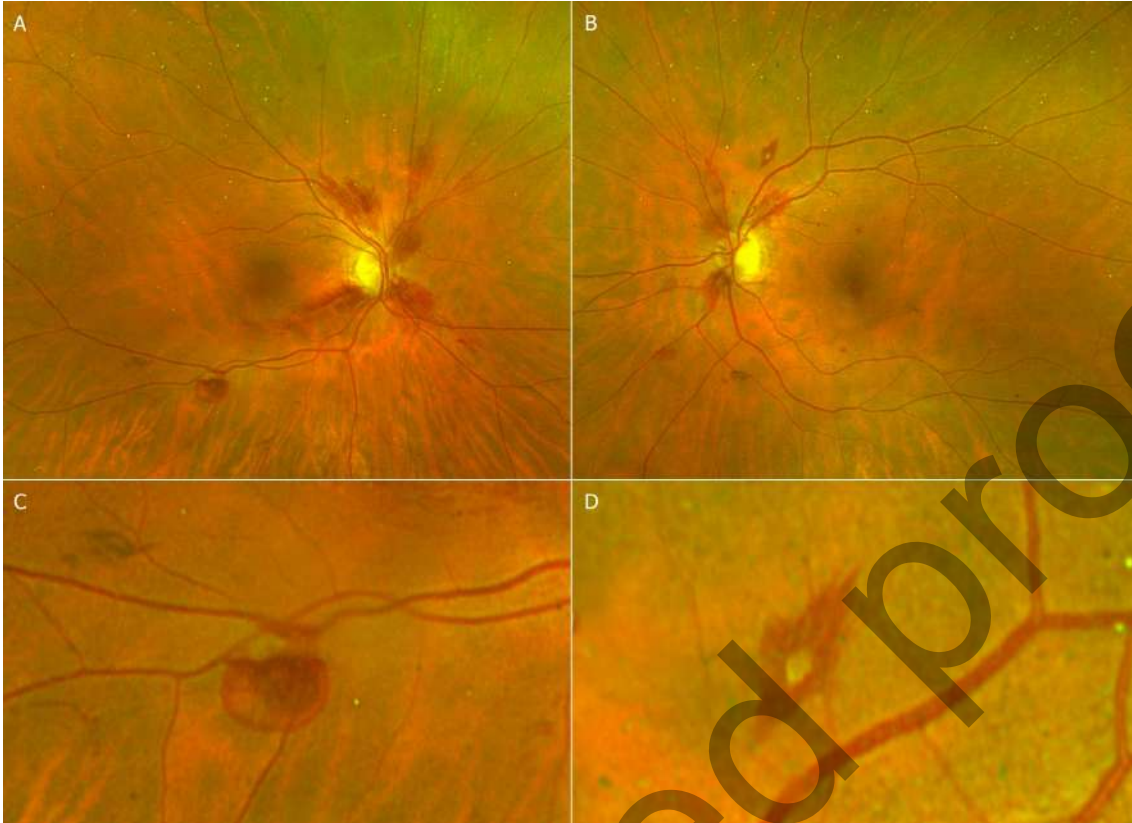
On the other hand, expression of CD7 and CD38 has been associated with increased risk of LRON in acute myeloid leukemia<sup>1</sup>. Retinopathy generally resolves with systemic leukemia treatment; however, patients with ocular involvement may have higher mortality in some studies.<sup>1</sup>

The patient responded favorably to treatment, with significant improvement in her overall condition. Two months later, fundus examination showed complete resolution of the retinal hemorrhages.

These observations highlight the need for a thorough ophthalmic assessment, including a dilated fundus examination, at the time of leukemia diagnosis, since ocular involvement is frequent and may be clinically silent.<sup>9,10</sup>

## References

1. Chen CY, Jhang JP, Lai YJ, Lin CW, Chou ET, Lin CC, Tsai XC, Tien FM, Hou HA, Tien HF, Chou WC, Yao CY, Chen TC. Clinical Manifestations and Ophthalmic Outcomes of Leukemic Retinopathy and Optic Neuropathy in Patients With Acute Leukemia. *Invest Ophthalmol Vis Sci.* 2025 Aug 1;66(11):2. doi: 10.1167/iovs.66.11.2. PMID: 40747974; PMCID: PMC12320904.
2. Reddy SC, Jackson N, Menon BS. Ocular involvement in leukemia--a study of 288 cases. *Ophthalmologica.* 2003 Nov-Dec;217(6):441-5. doi: 10.1159/000073077. PMID: 14573980.
3. Němčanská S, Stepanov A, Němčanský J. Ophthalmic manifestations of acute leukaemias. *Cesk Slov Oftalmol.* 2018 Winter;74(3):98-101. English. doi: 10.31348/2018/1/3-3-2018.
4. Hmila L, Bonnafous M, Albornoz DJ, Renaudier P, Merle H. Leucémie aiguë promyélocytaire révélée par des taches de Roth et un œdème papillaire bilatéral au fond d'œil : à propos d'un cas [Roth spots and bilateral disc edema on fundus examination as presenting sign of acute promyelocytic leukemia: Case report]. *J Fr Ophtalmol.* 2022 May;45(5):e217-e220. French. doi: 10.1016/j.jfo.2021.08.023.
5. Chien CC, Chen YY, Y-H C, S-I P. Roth spots in acute promyelocytic leukemia. *QJM.* 2022 Jan 5;114(11):826-827. doi: 10.1093/qjmed/hcab238.
6. Chandra A, Chakraborty U, Ganai S, Ray AK. Roth spots in acute myeloid leukaemia. *BMJ Case Rep.* 2020 Sep 2;13(9):e238133. doi: 10.1136/bcr-2020-238133.
7. Cogan DG. Ocular involvement in disseminated intravascular coagulopathy. *Arch Ophthalmol.* 1975 Jan;93(1):1-8. doi: 10.1001/archophth.1975.01010020005001. PMID: 1111481.
8. Azar P, Smith RS, Greenberg MH. Ocular findings in disseminated intravascular coagulation. *Am J Ophthalmol.* 1974 Sep;78(3):493-6. doi: 10.1016/0002-9394(74)90237-2.
9. Mirshahi R, Ghassemi F, Koochakzadeh L, Faranoush M, Ghomi Z, Mehrvar A, Mousavi SA, Safaee Nodehi SR. Ocular Manifestations of Newly Diagnosed Acute Leukemia Patients. *J Curr Ophthalmol.* 2022 Apr 16;34(1):100-105. doi: 10.4103/joco.joco\_10\_21. PMID: 35620369; PMCID: PMC9128435.
10. Scripcă OR, Pădurariu C, Boricean NG, Botoș L. Leukemic retinopathy, the first manifestation in a case of acute myelogenous leukemia. *Rom J Ophthalmol.* 2018 Jan-Mar;62(1):72-77. PMID: 29796437; PMCID: PMC5959028.



**Figure 1.** Fundus photographs demonstrating bilateral leukemic retinopathy.

A) Wide-field color fundus image of the right eye showing diffuse retinal vascular tortuosity, peripapillary flame-shaped hemorrhages and scattered retinal hemorrhages. A well-circumscribed, round intraretinal hemorrhage—consistent with a blot hemorrhage—is visible in the inferior temporal quadrant (boxed region).

B) Wide-field color fundus image of the left eye displaying similar vascular changes, including dilated tortuous vessels and multiple peripapillary flame-shaped hemorrhages. A flame-shaped hemorrhage with a central whitish component is present along the superior arcade (boxed region), also compatible with a Roth spot.

C) Magnified view of the blot hemorrhage in the right eye.

D) Magnified view of the Roth spot in the left eye.