

association between the abnormal MRI findings and the subsequent diagnosis of malignancy was lacking, the slow progression of such disorders, compared with acute leukemias, and the previously described patchy disease distribution of such less aggressive myeloid malignancies in the of the lower limb strongly suggest that this association is plausible.⁹

Malignancies of both hematopoietic and lymphoid origin were diagnosed in the cases presented here, indicating that these hematologic disorders could both present with pathological MRI findings.^{5,10-12} Current guidelines emphasize the need for rapid diagnostic follow-up in patients with proven or suspected acute leukemias,¹³ and the risk for delayed diagnosis of an aggressive malignancy has to be considered when managing patients with bone marrow abnormalities incidentally found on MRI. Prompt diagnosis is important in patients with APL to avoid early death due to coagulopathy,^{14,15} as well as in patients with non-APL variants of AML and few circulating blasts for long-term leukemia-free survival after treatment.¹⁶

Conclusions

In conclusion, abnormal MRI findings in bone marrow can be part of the initial presentation of hematologic malignancies, as well as the first observation suggesting that further bone marrow examinations are indicated. Physicians should be aware of this possibility, so that further focused and prompt diagnostic follow-up can be instigated. This is of particular importance if acute leukemia is suspected to avoid delayed initiation of treatment.

References

1. Mouloupoulos LA, Dimopoulos MA. Magnetic resonance imaging of the bone marrow in hematologic malignancies. *Blood* 1997;90:2127-47.
2. Takagi S. Magnetic resonance imaging of bone marrow in hematologic malignancies. *Int J Hematol* 1997;66:413-22.
3. Toft N, Birgens H, Abrahamsson J, et al. Risk group assignment differs for children and adults 1-45 yr with acute lymphoblastic leukemia treated by the NOPHO ALL-2008 protocol. *Eur J Haematol* 2013;90:404-12.
4. Orme NM, Fletcher JG, Siddiki HA, et al. Incidental findings in imaging research: Evaluating incidence, benefit, and burden. *Arch Intern Med* 2010;170:1525-32.
5. Silva JR Jr, Hayashi D, Yonenaga T, et al. MRI of bone marrow abnormalities in hematological malignancies. *Diagn Interv Radiol* 2013;19:393-9.
6. Navarro SM, Matcuk GR, Patel DE, et al. Musculoskeletal imaging findings of hematologic malignancies. *Radiographics* 2017;37:891-900.
7. Karchevsky M, Babbs S, Schweitzer ME. Can diffusion-weighted imaging be used to differentiate benign from pathologic fractures? A meta-analysis. *Skeletal Radiol* 2008;37:791-5.
8. Dutoit J, Verstraete KL. MRI in multiple myeloma: a pictorial review of diagnostic and post-treatment findings. *Insights Imaging* 2016;7:553-69.
9. Keraliya AR, Krajewski KM, Jagannathan JP, et al. Multimodality imaging of osseous involvement in haematological malignancies. *Br J Radiol* 2016;89:20150980.
10. Shih TT, Hou HA, Liu CY, et al. Bone marrow angiogenesis magnetic resonance imaging in patients with acute myeloid leukemia: peak enhancement ratio is an independent predictor for overall survival. *Blood* 2009;113:3161-7.
11. Rahmouni A, Montazel JL, Divine M, et al. Bone marrow with diffuse tumor infiltration in patients with lymphoproliferative diseases: dynamic gadolinium-enhanced MR imaging. *Radiology* 2003;229:710-7.
12. Tsunoda S, Takagi S, Tanaka O, Miura Y. Clinical and prognostic significance of femoral marrow magnetic resonance imaging in patients with malignant lymphoma. *Blood* 1997;89:286-90.
13. Döhner H, Weisdorf DJ, Bloomfield CD. Acute myeloid leukemia. *N Engl J Med* 2015;373:1136-52.
14. Sanz MA, Grimwade D, Tallman MS, et al. Management of acute promyelocytic leukemia: recommendations from an expert panel on behalf of the European LeukemiaNet. *Blood* 2009;113:1875-91.
15. Breen KA, Grimwade D, Hunt BJ. The pathogenesis and management of the coagulopathy of acute promyelocytic leukaemia. *Br J Haematol* 2012;156:24-36.
16. Sekeres MA, Elson P, Kalaycio ME, et al. Time from diagnosis to treatment initiation predicts survival in younger, but not older, acute myeloid leukemia patients. *Blood* 2009;113:28-