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## Magnetic Resonance Imaging

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# Localized in vivo proton spectroscopy of the bone marrow in patients with leukemia

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### Abstract

Volume selective magnetic resonance (MR) proton spectroscopy was used to investigate the haemopoietic (iliac bone) and fatty bone marrow (tibia) in patients with leukemia and polycythaemia vera. Selective measurements of the relaxation times  $T_1$  and  $T_2$  for the "water" and "fat" resonances in the bone marrow spectra were performed. Nine patients with acute leukemia and three patients with chronic leukemia were examined at diagnosis. Three patients with acute leukemia in remission were also examined. Five of the leukemic patients had follow-up examinations performed in relation to chemotherapeutic treatment. Nine patients with polycythaemia vera and 21 normal control subjects were examined with identical methods for comparison. All patients had bone marrow biopsies performed prior to every MR examination. Significant differences could be detected in the spectral patterns from iliac bone marrow in patients

with leukemia at diagnosis compared to the healthy normal controls. The "relative water content" was increased in the iliac bone marrow spectra of the leukemic patients compared to the normal subjects, which indicates an increase in the amount of haemopoietic tissue and a corresponding decrease in marrow fat content. The  $T_1$  relaxation times of the "water" resonance in the spectra from the iliac bone marrow of the leukemic patients were significantly prolonged at diagnosis, compared to the normal controls and the patients with polycythaemia vera. After chemotherapeutic induction of remission, the spectra from the iliac bone marrow in the patients with leukemia resembled normal spectra. Four leukemic patients had abnormal spectra from the tibial bone marrow and one patients showed early changes in tibial marrow during chemotherapeutic treatment, before any major changes could be detected in the iliac bone marrow.



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## Keywords

Magnetic resonance imaging; Magnetic resonance spectroscopy; Bone marrow; Acute leukemia, human; NMR; Chemotherapy

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