¹⁸F-FDG PET/CT for Detection of Metachronous Hodgkin's Disease in Patients with Myelofibrosis

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A 66-year-old man with a history of JAK2+ myelofibrosis and newly diagnosed space-occupying liver lesions, fever and weight loss underwent whole-body ¹⁸F-fluorodeoxyglucose (FDG) positron emission tomography/computed tomography (PET/CT) for further evaluation. Myelofibrosis had been diagnosed 4 years before, after the patient had suffered from polycythemia vera for 18 years. He had received an allogeneic stem cell transplantation from an unrelated donor 3 years before. ¹⁸F-FDG PET/CT detected increased inhomogeneous tracer uptake throughout the skeleton and in multiple space-occupying liver lesions (Fig. 1a–d). Histopathological evaluation revealed Hodgkin's lymphoma with hepatic and osseous involvement (Fig. 1e–j).

Primary myelofibrosis and the clinically indistinguishable secondary forms of myelofibrosis (post-essential thrombocythemia and polycythemia vera myelofibrosis, post-ET/PV myelofibrosis) are *BCR-ABL1*-negative hematopoietic stem cell diseases characterized by chronic myeloproliferation [1, 2]. Myelofibrosis is characterized by progressive bone marrow fibrosis, which reduces medullary erythropoietic sites and causes

peripheral pancytopenia. Reduction of medullary hematopoiesis leads to extramedullary hematopoiesis, mainly observed as splenomegaly [2, 3]. Patients may present with a variety of symptoms including night sweats, fatigue and thrombotic events [3]. Average life expectancy is 5 to 7 years. Leukemic transformation into secondary acute myeloid leukemia may be observed to occur in 8 % to 23 % of patients [4, 5]. In addition, metachronous occurrence of other hematologic malignancies including non-Hodgkin lymphoma can be observed [6]. Although such an association of myeloproliferative and lymphoproliferative disorders may occur after cytotoxic drug or radiation exposure, the combination of Hodgkin's lymphoma and post-PV myelofibrosis is exceedingly rare.

This report highlights the potential usefulness of ¹⁸F-FDG PET/CT to correctly identify other more aggressive hematologic malignancies in the context of pre-existing myelofibrosis. In recent years, PET/CT using ¹⁸F-FDG has been increasingly used as a morphofunctional imaging modality for both initial assessment and therapy monitoring in various hematologic malignancies [7–9]. Moreover, ¹⁸F-FDG PET/CT is a highly sensitive technique for detection of extramedullary involvement [10]. Bone marrow uptake of ¹⁸F-FDG in myelofibrosis is usually homogeneous [11], and any lesion with focally increased and inhomogeneous uptake should undergo biopsy for exclusion of leukemic transformation or synchronous lymphoma. This is a case of Hodgkin's lymphoma in the context of myelofibrosis initially detected on ¹⁸F-FDG PET/CT.

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Fig. 1 Whole-body maximum intensity projection FDG PET image (a) demonstrating increased inhomogeneous tracer uptake throughout the skeleton (arrowheads) and in the liver (arrows). Corresponding transversal CT (b), PET (c) and fused PET/CT images (d) showing marked tracer uptake in a space-occupying liver lesion (arrow). Corresponding microphotograph (e, $\times 110$ magnification) showing fibrotic change of the liver

parenchyma with focal infiltrates of CD30 (f, $\times 200$) and EBV-LMP (g, $\times 200$) positive cells, consistent with Hodgkin's lymphoma. Bone marrow biopsy demonstrating myelofibrotic changes and focal infiltrates (h, $\times 110$) of CD30 (i, $\times 200$), CD 15 (j, $\times 200$) positive Hodgkin- and Reed-Sternberg-like blasts

Conflict of Interest Thorsten Derlin and Till S. Clauditz declare that they have no conflict of interest.

Informed Consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from the patient for being included in the study.

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