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First in human PET/MRI imaging of *in vivo* GD2 expression in osteosarcoma

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Osteosarcoma is a malignant bone tumor with very limited therapeutic options (*1*). However, targeting the frequently overexpressed disialoganglioside GD2 was successful in preclinical studies with bispecific GD2 antibodies (*2*) and clinical trials are ongoing using the clinically approved GD2 antibody dinutuximab in osteosarcoma patients (NCT02484443). Recently, we developed the radiolabelled antibody [^{64}Cu]Cu-DOTAGA-ch14.18/CHO to evaluate GD2 expression by PET *(3)*.

Here, we assessed the *in vivo* GD2 expression in a heavily pretreated female patient suffering from progressive pulmonal osteosarcoma metastasis for potential therapy stratification (compassionate use according to German Medicinal Products Act AMG §13.2b). PET/MRI was performed 19 hours p.i. of 234 MBq of [^{64}Cu]Cu-NOTA-ch14.18/CHO and revealed increased tracer retention with high signal to background ratio in the bi-pulmonal metastases (SUVmax 9.8). The background uptake in normal lung tissue and blood pool was reasonably low, while retention in the liver was relatively high. An intense GD2 expression was confirmed in a resected pulmonal metastasis by GD2-immunohistochemistry as well as cyclic immunofluorescence staining.

To the best of our knowledge, we present here the first report on clinical GD2-PET/MRI in an osteosarcoma patient with pulmonal metastasis. Our findings demonstrate that GD2 expression can be assessed non-invasively *in vivo* using [^{64}Cu]Cu-NOTA-ch14.18/CHO-PET/MRI which might open new possibilities for therapy stratification in GD2 expressing tumor entities such as osteosarcoma or melanoma.

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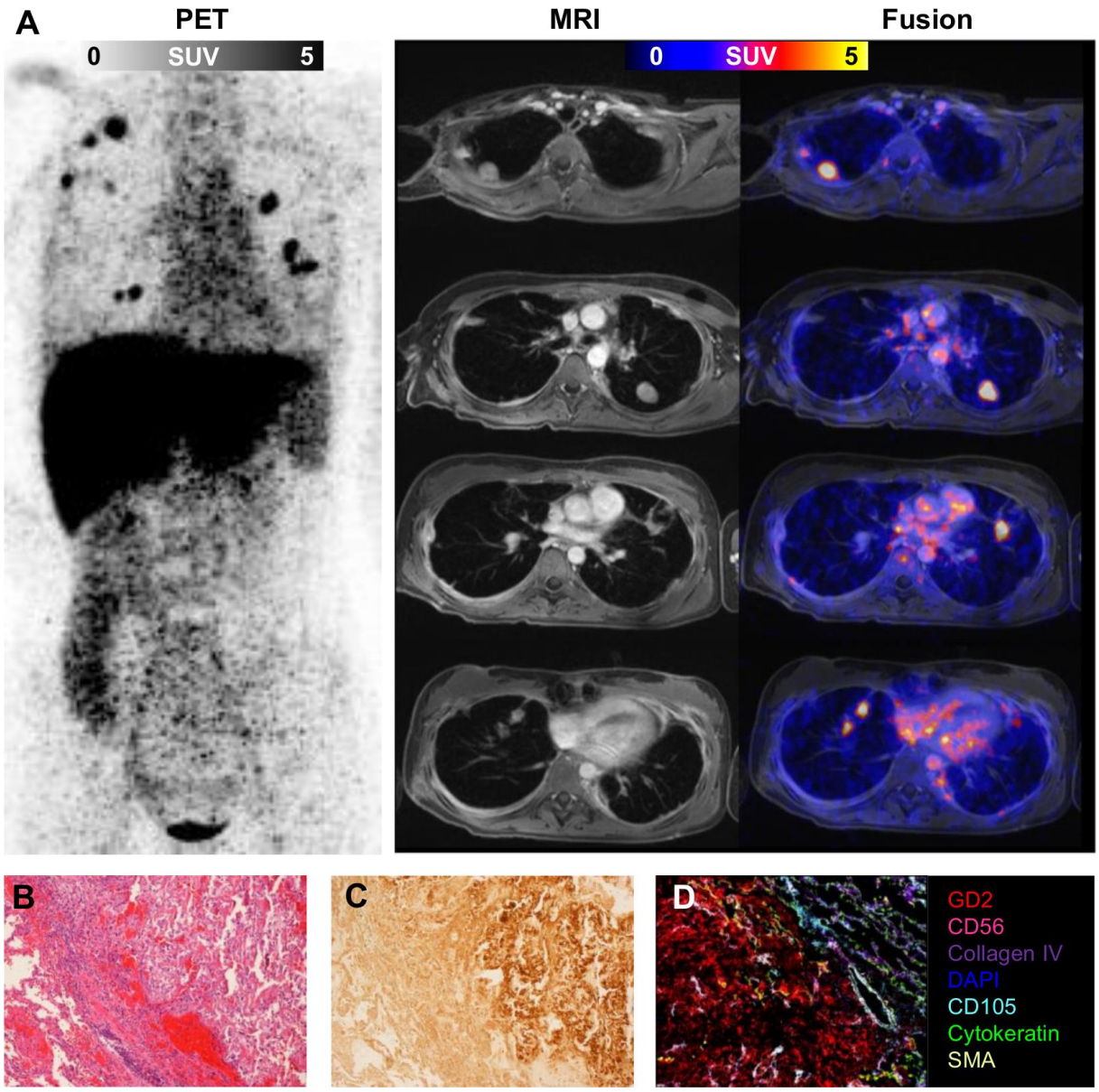

A Maximum intensity projection (left) as well as representative transaxial slices of the [^{64}Cu]Cu-NOTA-ch14.18/CHO-PET/MRI. **B** H&E staining, **C** GD2-immunochemistry and **D** cyclic immunofluorescence staining of a resected pulmonal osteosarcoma metastasis.