In vivo molecular imaging of chemokine receptor CXCR4 expression in patients with advanced multiple myeloma.

CXCR4 is a G-protein-coupled receptor that mediates recruitment of blood cells toward its ligand SDF-1. In cancer, high CXCR4 expression is frequently associated with tumor dissemination and poor prognosis. We evaluated the novel CXCR4 probe \([{(68)\text{Ga}}]\)Pentixafor for in vivo mapping of CXCR4 expression density in mice xenografted with human CXCR4-positive MM cell lines and patients with advanced MM by means of positron emission tomography (PET). \([{(68)\text{Ga}}]\)Pentixafor PET provided images with excellent specificity and contrast. In 10 of 14 patients with advanced MM \([{(68)\text{Ga}}]\)Pentixafor PET/CT scans revealed MM manifestations, whereas only nine of 14 standard \([(18)\text{F}}]\)fluorodeoxyglucose PET/CT scans were rated visually positive. Assessment of blood counts and standard CD34(+) flow cytometry did not reveal significant blood count changes associated with tracer application. Based on these highly encouraging data on clinical PET
imaging of CXCR4 expression in a cohort of MM patients, we conclude that [(68)Ga]Pentixafor PET opens a broad field for clinical investigations on CXCR4 expression and for CXCR4-directed therapeutic approaches in MM and other diseases.