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Case Report OMICS International

PET/MR in Relapsed Multiple Myeloma

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Abstract

Multiple myeloma is a hematologic malignancy characterized by a clonal proliferation of plasma cells. PET/MR is a new emerging hybrid imaging modality, its potential role in numerous different malignant diseases is under extensive evaluation. Our report describes PET/MR findings of a relapsed multiple myeloma case.

Keywords: PET/MR; Myeloma; Multimodality imaging; Functional imaging

Introduction

Multiple myeloma (MM) is defined as a malignant proliferation of plasma cells, principally involving the bone marrow. Disease expression is very heterogeneous including diffuse bone marrow infiltration, focal bone destruction or extramedullary lesions [1-4]. The use of advanced whole body imaging techniques in plasma cell dyscrasias is supported by growing evidence and guideline inclusions [5,6]. PET/MR is a new generation hybrid multimodality imaging technique providing unique opportunity to acquire structural, functional and metabolic information simultaneously and to overcome the limitations of each components [7].

Case Report

Multiple myeloma diagnosis was established in January 2015 for a 63 years old female patient (bone marrow: 80% plasma cells; IgA: 45.1 g/l; total serum protein: 115 g/l, SD-IIIB, SPSSIII). 5 cycles of bortezomib-thalidomide-dexamethasone polichemotherapy regimen was administered to the patient per protocol, and good partial response was achieved. After high dose melphalan conditioning Autologous Stem Cell Transplantation (ASCT) was carried out. 3 months later the ASCT bone marrow aspiration and flow cytometry were obtained and increased plasma cell fraction was not detectable. Skeletal radiography did not reveal any osseal myeloma lesion. In June 2016, the patient complained about painful left arm swelling and referred to PET/MR. Whole body PET/MR examination was performed on a Siemens Biograph mMR scanner, consisting of a 3.0 Tesla magnet, an actively shielded whole-body gradient coil system, and an integrated MR compatible lutetium oxyorthosilicate-based avalanche photodiode containing PET detector system for simultaneous acquisition. Axial T1 weighted (T1W) Dixon, axial diffusion weighted (DWI) and coronal Turbo Inversion Recovery Magnitude (TIRM) sequences were obtained, and simultaneous 3D PET acquisition after intravenous F18 Fluorodeoxyglucose (FDG) radiotracer administration was carried out. The examination revealed multifocal, partly confluent myeloma manifestations along the skeleton (skull, sternum, ribs, humeral and femoral bones, clavicles, scapulas, vertebral column, pelvic bones) with low T1 signal intensity and high signal intensity foci on TIRM and DWI MR Sequences, and pathologic FDG accumulation on the PET images (Figures 1 and 2). At left perihumeral location a spacious mass forming soft tissue lesion / suggested to be extraosseus plasmocytoma/ (Figure 1, red arrow), in the left distal femoral region - inseparable from the muscles – a smaller soft tissue focus were also observed (Figure 2, red arrow). Biopsy from the left femoral soft tissue lesion confirmed plasmocytoma. Based on the widespread relapse visualized on PET/MR examination and also confirmed by bone marrow evaluation (25% plasma cells) as a part of complex oncotherapy palliative external beam radiation was given for the perihumeral disorder to decrease patient complaints, low dose cyclophosphamide and dexamethason treatment was administered and lenalidomide therapy was introduced.

Discussion

Medical imaging is of crucial importance in multiple myeloma. Whole body MRI and 18F-FDG PET/CT feature the highest sensitivity for detecting medullary, osseous, soft tissue lesions and organ manifestations respectively among the established cross-sectional imaging techniques. MRI has the highest sensitivity for detection of bone marrow involvement and 18F-FDG PET/CT for detection of extraosseal lesions [6]. Unlike other multimodality techniques (SPECT/CT and PET/CT) allowing only sequential imaging capabilities, PET/MR enables simultaneous and synergistic multiparametric acquisition. Despite the obvious potential advantages of PET/MR method its wider clinical penetration is mainly restricted by low worldwide availability and reimbursement issues. Ongoing imaging protocol optimization is also a key factor to maximise benefits in parallel with scanning time reduction [7,8]. The integration of high potential PET and MR modalities into a "one stop shop" examination provides unique opportunity to investigate different aspects of MM pathophysiology and collect complementary biological information [9].

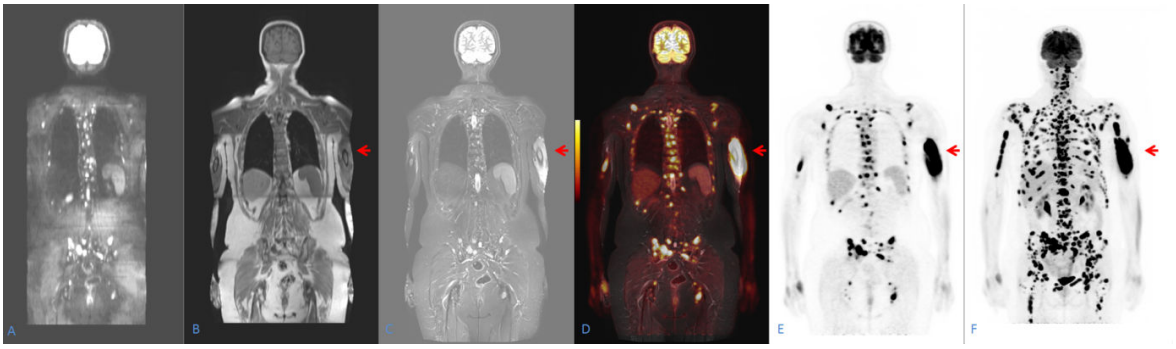

Figure 1: Multiple skeletal myeloma manifestations on coronal DWI (A), T1W (B), TIRM (C), Fused PET/TIRM MR (D), PET images (E), and on 3D Maximal Intensity Projection (MIP) anterior aspect PET dataset (F). Spacious left perihumeral soft tissue mass (red arrow) with inhomogeneous T1 signal (B), high TIRM signal intensity (C) and intensive FDG accumulation respectively (D-E-F). Upper extremities are not visualized on the DWI image dataset as a consequence of smaller available MR field of view.

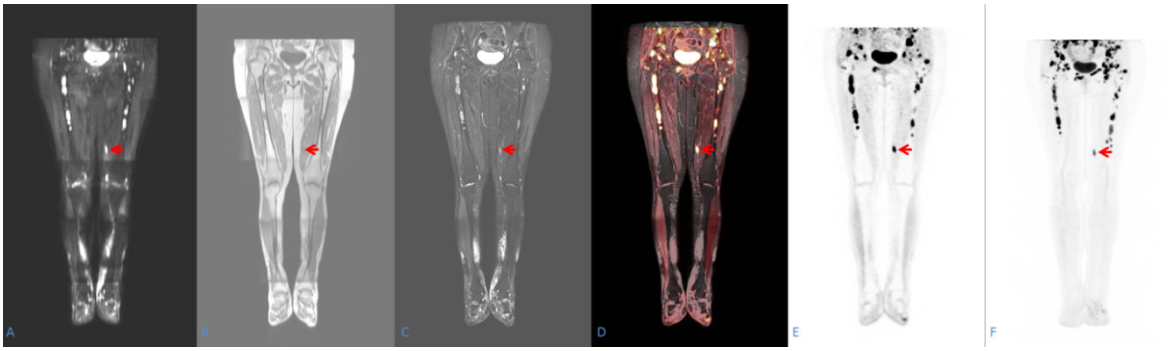

Figure 2: MM manifestations on coronal DWI (A), T1W (B), TIRM (C), Fused PET/TIRM MR (D), PET images (E) and on 3D MIP anterior aspect PET dataset (F) of the lower extremities. At the medial side of left distal femoral region, among the muscles circumscribed soft tissue lesion (red arrow) with focal low T1 signal intensity (B), high DWI (A) and TIRM (C) signal intensity and intensive FDG accumulation respectively (D-E-F).

References

1. Kyle RA, Gertz MA, Witzig TE, Lust JA, Lacy MQ, et al. (2003) Review of 1027 patients with newly diagnosed multiple myeloma. Mayo Clin Proc 78: 21-33.
2. Sirohi B, Powles R (2004) Multiple myeloma. Lancet 363: 875-887.
3. International Myeloma Working Group (2003) Criteria for the classification of monoclonal gammopathies, multiple myeloma and related disorders: a report of the International Myeloma Working Group. Br J Haematol 121: 749-757.
4. Palumbo A, Anderson K (2011) Multiple myeloma. N Engl J Med 364: 1046-1060.
5. Dimopoulos M, Terpos E, Comenzo RL, Tosi P, Beksac M, et al. (2009) International myeloma working group consensus statement and guidelines regarding the current role of imaging techniques in the diagnosis and monitoring of multiple Myeloma. Leukemia 23: 1545-1556.
6. Derlin T, Bannas P (2014) Imaging of multiple myeloma: Current concepts. World J Orthop 5: 272-282.
7. Bernd P, Hans FW, Armin K, Martin SJ (2008) PET/MRI: The next generation of multi-modality imaging? Semin Nucl Med 38: 199-208.
8. Bailey DL, Pichler BJ, Gückel B, Barthel H, Beer AJ, et al. (2016) Combined PET/MRI: from Status Quo to Status Go. Summary Report of the Fifth International Workshop on PET/MR Imaging; February 15–19, 2016; Tübingen, Germany. Mol Imaging Biol 18: 637-650.
9. Vij R, Fowler KJ, Shokeen M (2016) New Approaches to Molecular Imaging of Multiple Myeloma. J Nucl Med 57: 1-4.