

Whole-body MRI, including diffusion-weighted imaging, for staging lymphoma: comparison to CT in 101 patients

Thomas Kwee¹, Malou Vermoolen¹, Erik Akkerman², Marie José Kersten³, Rob Fijnheer⁴, Inge Ludwig⁵, Frederik Beek¹, Maarten van Leeuwen¹, Marc Bierings⁶,

Joseph Zsiro⁷, Henriëtte Quarles van Ufford¹, Jaap Stoker², Willem Mali¹, and Rutger-Jan Nielstein¹

¹Radiology, UMC Utrecht, Utrecht, Netherlands, ²Radiology, AMC Amsterdam, Amsterdam, Netherlands, ³Hematology, AMC Amsterdam, Amsterdam, Netherlands,

⁴Hematology, Meander MC, Amersfoort, Netherlands, ⁵Hematology, UMC Utrecht, Utrecht, Netherlands, ⁶Pediatric Hematology, UMC Utrecht, Utrecht, Netherlands,

⁷Pediatric Hematology, AMC Amsterdam, Amsterdam, Netherlands

Introduction

The lymphomas comprise approximately 5% to 6% of all malignancies and are the fifth most frequently occurring type of cancer in the Western World (1). Accurate staging of patients with lymphoma is of crucial importance because it allows appropriate treatment planning and determining prognosis (2). CT is still the mainstay for staging of lymphoma (3), but uses potentially carcinogenic ionizing radiation. Whole-body MRI does not use any ionizing radiation and may be a good alternative to CT. Furthermore, implementation of diffusion-weighted imaging (DWI) in a whole-body MRI protocol may facilitate staging because of its high lesion-to-background contrast (4). The aim of this multicenter study was therefore to compare whole-body MRI, including DWI, to CT for staging newly diagnosed lymphoma.

Subjects and Methods

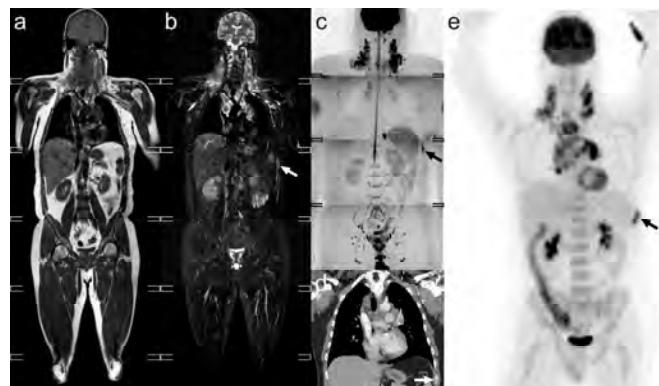
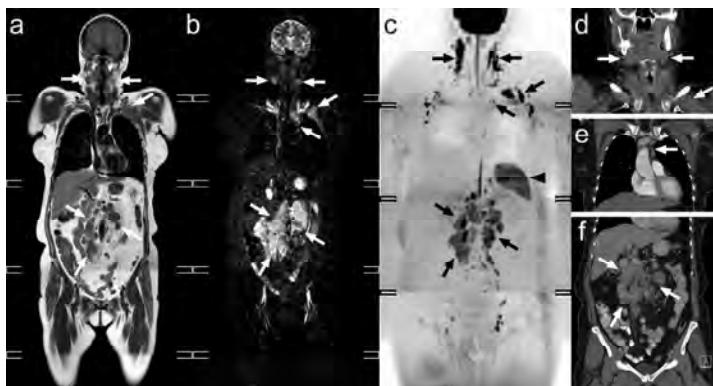
One hundred and one consecutive patients with newly diagnosed lymphoma prospectively underwent whole-body MRI (T1W and T2W-STIR [n=101], and DWI [n=96]) and CT. Ann Arbor stages were assigned according to whole-body MRI and CT findings. Disagreements in staging between whole-body MRI (without and with DWI) and CT were resolved using bone marrow biopsy, FDG-PET, and follow-up FDG-PET, CT, and whole-body MRI studies as reference standard.

Results

Staging results of whole-body MRI without DWI were equal to those of CT in 65.4% (66/101), higher in 30.7% (31/101), and lower in 4.0% (4/100) of patients, with correct/incorrect/unresolved overstaging and incorrect/unresolved understaging relative to CT in 13/12/6 and 3/1 patient(s), respectively. Staging results of whole-body MRI with DWI were equal to those of CT in 62.5% (60/96), higher in 32.3% (31/96), and lower in 5.2% (5/96) of patients, with correct/incorrect/unresolved overstaging and incorrect/unresolved understaging relative to CT in 18/10/3 and 4/1 patient(s), respectively. The most common site where whole-body MRI (both without and with DWI) provided correct overstaging relative to CT was the bone marrow, whereas incorrect overstaging relative to CT mostly occurred in lymph nodes and the liver. There were no cases in which whole-body MRI (both without and with DWI) provided correct understaging relative to CT, whereas incorrect understaging relative to CT occurred because of missing lung/pleural lesions and lymphomatous lymph nodes. Representative images are displayed in Figures 1 and 2.

Figure 1. Coronal T1W (a), T2W-STIR (b), and greyscale inverted diffusion-weighted (c) images, and coronal CT images of the head/neck (d), chest (e), and abdomen/pelvis (f) in a 60-year-old female with diffuse large B-cell lymphoma. Both T1W, T2W-STIR, DWI, and CT show bilateral cervical, left infraclavicular, mediastinal, mesenteric, and para-aortic lymph node involvement (arrows), corresponding to stage III disease. Also note normal high signal intensity of the spleen (arrowhead).

Figure 2. Coronal T1W (a), T2W-STIR (b), and greyscale inverted diffusion-weighted (c) images, coronal CT (d) image of the chest, and coronal FDG-PET (e) in a 34-year-old male with Hodgkin lymphoma. Both whole-body MRI (without and with DWI) and CT showed involvement of bilateral cervical, mediastinal, and hilar lymph node stations. However, a lesion of the 9th rib was only seen at DWI (c, arrow). Therefore, whole-body MRI without DWI and CT suggested stage II disease, whereas whole-body MRI with DWI suggested stage IV disease. The rib lesion was positive at FDG-PET, indicating that whole-body MRI provided correct overstaging relative to CT and whole-body MRI without DWI. Retrospective review showed that this rib lesion was also visible at T2W-STIR and CT (b and d, arrows).



Conclusions

Staging of newly diagnosed lymphoma using whole-body MRI (without and with DWI) equals staging using CT in the majority of patients. Disagreements between whole-body MRI and CT are mostly caused by overstaging of the former relative to the latter, with the number of correctly and incorrectly overstaged cases being approximately equal. This underlines the fact that both whole-body MRI and CT are unique imaging modalities, each having its own strengths and weaknesses. The potential advantage of DWI is still unproven.

References

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