

SCIENTIFIC SESSION PRESENTATION

Open Access

Multiparametrical diffusion weighted imaging for the detection of anaplastic transformation of low-grade gliomas

MT Freitag^{1*}, C Weber^{1,2}, K Maier-Hein^{1,2}, R Tarnawski³, B Bobek-Billewicz³, F Binczyck⁴, J Polanska⁴, B Stieltjes¹

From International Cancer Imaging Society (ICIS) 14th Annual Teaching Course Heidelberg, Germany. 9-11 October 2014

Aim

The precise detection of anaplastic transformation in low-grade gliomas using magnetic resonance imaging (MRI) is impeded by postoperative changes in brain tissue. We tested the diagnostic value of diffusion tensor-derived axial diffusivity (AD), mean diffusivity (MD) (=apparent diffusion coefficient) and radial diffusivity (RD) maps in comparison to T1w and T2w sequences.

Methods

The study was approved by the local ethics committee. Forty-seven patients with histopathologically proven low-grade glioma II° were included, 28 were stable and 19 patients had post-surgical anaplastic transformation. All patients underwent pre-operative MRI, surgery and subsequent post-operative MRI follow-ups at 1.5T including T1w, T2w sequences and a DTI-protocol. The scalar indices AD, MD and RD were calculated voxel-by-voxel for all patients from the tensor eigenvalues and the minimum value within a gross tumour segmentation was extracted using MITK-Diffusion, respectively.

Results

Hypointense clusters were seen in every patient with anaplastic transformation in the DTI maps with best contrast-to-noise in AD. In 65% of patients with anaplastic transformation, these clusters were noticed at the same time when compared to contrast enhancement. In 35% of patients, hypointense changes were visible in AD maps in examinations prior to the initial contrast enhancement.

AD_{min} showed best combined sensitivity/specificity (94.4%/89.7%, AUC 0.96) to indicate transformation.

Conclusion

AD maps provide additional essential information for anaplastic transformation of low-grade gliomas after resection and indicate the progress at the same time or earlier when compared to T1w-CE. We conclude that it is advisable to use a DTI-protocol instead of standard diffusion-weighted imaging for neuro-oncological exams.

Authors' details

¹German Cancer Research Center, Quantitative Imaging-based Disease Characterization, Department of Radiology, Heidelberg, Germany. ²German Cancer Research Center, Department of Medical Informatics, Heidelberg, Germany. ³Maria Skłodowska-Curie Memorial Cancer Center and Institute of Oncology, Gliwice, Poland. ⁴Silesian University of Technology, Data Mining Group, Gliwice, Poland.

Published: 9 October 2014

doi:10.1186/1470-7330-14-S1-S11

Cite this article as: Freitag et al.: Multiparametrical diffusion weighted imaging for the detection of anaplastic transformation of low-grade gliomas. *Cancer Imaging* 2014 **14**(Suppl 1):S11.

* Correspondence: m.freitag@dkfz.de

¹German Cancer Research Center, Quantitative Imaging-based Disease Characterization, Department of Radiology, Heidelberg, Germany
Full list of author information is available at the end of the article