AbstractID: 3653 Title: MRI-based treatment planning for radiotheraphy of brain lesions

Purpose:
The purpose of this work is to investigate the practicality of a treatment planning method based only on magnetic resonance imaging (MRI) for radiotherapy of brain patients.

Method and Materials:
MRI is the preferred imaging modality for target delineation because of its superior soft tissue contrast. The main drawback of this modality for treatment planning of intracranial lesions is the lack of electron density information in the MR images. To overcome this limitation, we assigned electron density values to anatomical structures based on contours. We used clinical data acquired on a 1.5T Intera MRI scanner to compare the MR and CT+MR-based treatment plans. To asses the effectiveness of the contouring procedures we used 1.5T and 3.0T MR images. The outlines of the skin, bone and brain were obtained by using a combination of autocontouring and profile tools available on Pinnacle and AcQSim MR. The treatment plans corresponding to CT+MR and MR-based methods were generated on Pinnacle RTP software, by using the same beam angles, dose constraints and optimization parameters.

Results:
The CT+MR and MR-based treatment plans were compared in terms of isodose distribution and dose volume histograms. The results are in good agreement. The average electron density value assigned to bone can be determined as a function of the threshold level set for the autocontouring procedure. MR image distortion artifacts were not an important factor, due to a small field of view and the use of a head coil. We found that the 3T T2-weighted images are the best candidate for contouring structures due to their superior contrast.

Conclusion:
Treatment plans based entirely on MR images produced similar results to CT+MR-based plans. Using MRI simulation, image fusion errors such as variations in patient setup and uncertainties in identifying similar structures between CT and MR are eliminated.