

AbstractID: 5281 Title: A complete MR-based treatment planning procedure for radiotherapy of intracranial lesions

**Purpose:**

The purpose of this study is to develop a complete treatment planning procedure for radiotherapy of brain lesions based solely on magnetic resonance imaging.

**Method and Materials:**

The MR-based treatment planning procedure relies on converting the MR images into CT-like images by assigning electron density information to organ structures (i.e. brain, bone and scalp). First step in the process is to correct the MR images for 3D geometrical distortions by applying a novel distortion correction procedure. The next stage is to segment the datasets into anatomical structures by using an automatic segmentation tool suited for MR brain images. Once the MR images contain both the target volume and the electron density information, they are ready to be used for dose calculations. The resulting CT+MR and MR-based plans were compared in terms of isodose distributions, DVHs and NTCP/TCPs. A plan ranking TCP-based method for heterogeneous irradiation, which does not require the knowledge of radiobiological parameters, is used.

**Results:**

For all patients investigated, we found that MR-based plans (1.5T and 3T) are in good agreement (within 1%) with their corresponding CT+MR-based plans in terms of PTV dose coverage, DVHs and NTCP/TCPs. We compared tumor contours drawn on both 1.5T and 3T MR images in terms of shape, volumes and their impact on CRT plans. For all patients the delineation of the tumor was simpler for 3T images due to higher contrast. For some patients the tumor volumes drawn on the 3T images were up to 60% higher than on 1.5T images. RT plan ranking shows that the 3T plans are significantly better than 1.5T ones.

**Conclusion:**

The proposed MR-based treatment planning procedure was found to perform as good as the current clinical procedure based on CT+MR. Due to a higher contrast the tumor may be significantly better delineated on 3T images.