

Abstracts

O2.03. TARGET DELINEATION IN GLIOBLASTOMA: IS PREOPERATIVE AUTOMATIC COMPARABLE TO EXPERT BASED SEGMENTATION?

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INTRODUCTION: To evaluate preoperative automatic structure segmentation of glioblastoma patients undergoing radiation therapy in clinical practice. **METHOD:** Automatic tumor segmentation was performed on preoperative MR images using the Brain Tumor Software Analysis (BraTumIA) software (www.istb.unibe.ch). We compared manual tumor volumetry based on postoperative MR images of 14 GBM patients (7 patients received 60 Gy/30 fractions; 7 other patients received 39.9 Gy/15 fractions) to the automatic approach. We employed four standard MRI sequences (T1, T1contrast, T2 and FLAIR) in order to segment the tumor sub-compartments (contrast enhancing tumor; CET, necrosis, non enhancing tumor; NET and

edema). Dice Similarity Coefficient (DSC) and Mean Surface Distance (MSD) were calculated to evaluate the quality of segmentations. For the evaluation of the dose deposition in GTV, CTV, CET, necrosis, NET and edema, an analysis of the following dose-volume histogram (DVH) parameters has been performed: D2%, D90%, D95%, D98% (dose exceeded in 2%, 90%, 95%, 98% of the volume) and Dmean (mean dose). Furthermore, the same DVH analysis of the composite structure “complete tumor volume +” (TV +) encompassing the CET, the necrosis, the NET and the edema has also been carried out. Based on these histograms a homogeneity index (HI) has been defined as $HI = (D2\% - D98\%) / Dp * 100$ where Dp is the prescribed dose. **RESULT:** DSC and MSD mean/SD overlap between automatic segmentation and manual contours was 0.52 ± 0.20 ; 5.1 ± 4.0 mm for necrotic tissue combined with CET vs GTV; 0.62 ± 0.18 and 8.2 ± 5.1 mm for TV+ vs CTV, respectively. No significant differences were observed between means of D2% D90% D95%, D98% and Dmean in GTV, CET and necrosis. Differences were found between the means of D98% in CTV60Gy and TV + 60Gy ($p = 0.006$) and CTV39.9Gy and TV + 39.9Gy ($p = 0.033$). Despite a good mean HI in PTV (8.1 ± 3.0 %), we found a higher mean value for TV+ (49.7 ± 41.1 %). These findings were due to false positives in the segmentation of the edema compartment of the TV+ in 4 out of 14 patients. This could indicate a weakness of BraTumIA in the segmentation of the edema compartment. **CONCLUSION:** Automated volumetry on preoperative MR revealed only subtle volume differences for the necrotic and enhancing tumor segments and postoperatively delineated GTV, whereas non-enhancing tumor plus edema volumes vs CTV were discordant. The DVH evaluation highlighted an underdosage of the edema in the D98% regions causing high HI values. Our data suggest that preoperative automatic volumetry adds converging information to adapt CTV of patients with GBM (including CET, necrosis and NET). The incorporation of the complete edema into the target volume has still to be addressed.