FET-PET for malignant glioma treatment planning.


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Abstract

BACKGROUND AND PURPOSE: The aim of this study was to compare MRI-based morphological gross tumour volumes (GTVs) to biological tumour volumes (BTVs), defined by the pathological radiotracer uptake in positron emission tomography (PET) imaging with (18)F-fluoroethyltyrosine (FET), subsequently clinical target volumes (CTVs) and finally planning target volumes (PTVs) for radiotherapy planning of glioblastoma.

PATIENTS AND METHODS: Seventeen patients with glioblastoma were included into a retrospective protocol. Treatment-planning was performed using clinical target volume (CTV=BTV+20mm or CTV=GTV+20mm+inclusion of the edema) and planning target volume (PTV=CTV+5mm). Image fusion and target volume delineation were performed with OTP-Masterplan®. Initial gross tumour volume (GTV) definition was based on MRI data only or FET-PET data only (BTV), secondarily both data sets were used to define a common CTV.

RESULTS: FET based BTVs (median 43.9cm(3)) were larger than corresponding GTVs (median 34.1cm(3), p=0.028), in 11 of 17 cases there were major differences between GTV/BTV. To evaluate the conformity of both planning methods, the index (CTV(MRT)∩CTV(FET))/(CTV(MRT)∪CTV(FET)) was quantified which was significantly different from 1 (0.73±0.03, p<0.001).

CONCLUSION: With FET-PET-CT planning, the size and geometrical location of GTVs/BTVs differed in a majority of patients. It remains open whether FET-PET-based target definition has a relevant clinical impact for treatment planning.

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