Purpose: To study the advantage of fused 3-deoxy-3-18F-fluorothymidine (FLT) positron emission tomography (PET) and computed tomography (CT) images on radiotherapy planning for esophageal carcinoma patients.

Methods: Ten patients with esophageal carcinoma were referred for radiotherapy. Each patient underwent CT and FLT PET scan for simulation plan in the same treatment position. FLT PET images were coregistered with CT images. GTVCT was initially performed on CT images, GTVPET-CT were automatically segmented on FLT PET/CT images using a fixed threshold values at 1.4. Two kinds of treatment plans were designed based on GTVCT and GTVPET-CT. The radiation dose was prescribed as 60 Gy in 30 fractions. The dose-volume parameters of target volume and normal tissues, CI and HI of based on the GTVPET-CT and GTVCT were compared.

Results: The mean GTV delineated on CT and PET-CT were 39.28 cm³ and 34.48 cm³, respectively. The values for mean lung dose, total-lung volume receiving ≥5, ≥10, ≥20 and ≥30 Gy; mean heart dose, heart volume receiving ≥30Gy and normal tissues of plan based on the GTVPET-CT were significant lower than plan based on the GTV-CT.

Conclusions: In our study, FLT PET use has an impact on target delineation for radiotherapy planning. GTVPET-CT is significantly smaller than GTVCT with a mean volume reduction of 16%. CT and FLT/PET image fusion appeared to have an advantage on dose reduction of organ at risk in radiotherapy planning of esophageal carcinoma.