Purpose:The aim of this study was to validate a gradient-based segmentation method for GTV delineation on FLT-PET in EC through surgical specimen, in comparison with threshold-based approaches and CT. Discuss the influences of gradient-based methods delineate the primary GTV to radiotherapy planning.

Methods:Ten patients with esophageal carcinoma treated with radical surgery were enrolled and detected by 18F-FLT PET/CT before operation transferred the images to MIM software. For each patient, four GTVs were defined. GTV-ct was based on CT data alone. GTV-GRAD, GTV-1.4, GTV-30%max were automatically segmented on PET images using the gradient-based method, fixed threshold values at 1.4 and 30% of SUVmax, respectively. The GTV-GRAD, GTV-1.4, GTV-30%max were compared with GTV-CT by overlap index. Lengths of GTVs were recorded as LCT, LGRAD, L1.4, L30%max, respectively. The length of surgical specimen was recorded as LPath , and compared with LCT, LGRAD, L1.4, L30%max. Next, two radiotherapy plans were designed for each patient based on GTV-GRAD (plan-GRAD) and GTV-CT (plan-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 plan-GRAD and plan-CT were compared.

Results:The mean LPath was 6.47±2.7. The mean Lct, LGRAD, L1.4 and L30%max were 7.17±2.28, 6.22±2.61, 6.23±2.80, 5.95±2.5.The correlation coefficients were 0.862, 0.989, 0.920 and 0.920 when compared with LPath , respectively. The overlap index of GTV-GRAD,GTV-1.4,GTV-30%max when compared with GTV-CT were 0.75±0.12, 0.71±0.12, 0.57±0.10.The values for mean lung dose, total-lung volume receiving more than 5, 10, 20, and 30Gy, mean heart dose and heart volume receiving more than 30Gy of plan-GRAD were significant lower than plan-CT.

Conclusions:The gradient-based method provided the closest estimation of GTV length. The gradient-based method radiotherapy planning reduced the irradiated volume in the lung, heart and other normal tissues.