

Propose: Measuring the setup errors and organ movements of patients with esophagus carcinoma during the radiotherapy, finding a reasonable margin from the Clinic Target Volume (CTV) to the Planning Target Volume (PTV).

Methods and methods: 1. *Set-up verification:* Forty-two cases of untreated esophageal cancer were enrolled into this study. The Physicist firstly made the planning according to the doctor requests and ensure the best distribution at the target. Thereafter, the 0° and 90° Digital Reconstructed Radiograph(DRR)were transmitted to the iView GT workshop. Meanwhile, two copies of cross-cut Electronic Portal Image (EPI), were required before radiotherapy. Two doctors confirm the variance of the osteal mark from the EPI and DRR, and output a 3 D direction (left to right, superior to inferior, anterior to posterior) of the setup errors through the iView GT software. 2. *Breathing motion:* Ten cases of untreated esophageal cancer were enrolled into this study. Three distinct breathing levels were defined: FB, EBH and IBH. We give the treatment planning in FB, then by moving the isocenter to EBH and IBH, we can recalculate the dose distribution without changing the field angle, shape and weighing(Mus). Displacements were analyzed at four points (anterior, posterior, right lateral and left lateral) and five levels of target (upper, quarter, isocenter, three-quarter and lower).

Result: (1)The systematic setup errors were -2.31mm, -0.16mm and -0.55mm, the random errors were 4.42mm, 4.48mm and 4.35mm at the direction of left to right(LR), superior to inferior (SI), anterior to posterior(AP)respectively. (2)The organ movements were 2.2mm,4.0mm and 2.0mm at the LR, SI, AP respectively.

Conclusion: As an alternative, the root-sum-of-squares of set-up error and organ motion is suggested, e.g. $\sigma_{tot}=\sqrt{(\sigma_{ITV}^2+\sigma_{SM}^2)}$.The CTV to PTV margin were 8mm left to right, 5.3mm superior to inferior, 4.6mm anterior to posterior.