

Purpose:At our institution distal esophageal cancer has been treated with three-dimensional conformal radiotherapy (3DCRT), usually with 5-9 non-opposing beams. Recently, TomoTherapy® introduced a helical 3DCRT (H3D) modality for faster treatment planning and delivery. The purpose of this study was to evaluate whether H3D can result in improvements over traditional 3DCRT.

Methods:Ten consecutive patients with lower third esophageal adenocarcinoma treated with 3DCRT to 45 Gy (1.8 Gy/fraction for 25 fractions) were selected for a retrospective treatment planning study. 3DCRT plans were created using XIO (Version 4.4, CMS Inc, St. Louis, MO). H3D plans were generated using TomoTherapy Planning Station (Version 4.0.3, Madison, WI). As a 3D planning mode, H3D allows PTV coverage to be specified but no other optimization. PTV coverage was matched in 3DCRT and H3D plans. Jaw size of 2.5 cm and a pitch of 0.287 were used. Dose volume histograms, heterogeneity index and treatment delivery time were compared.

Results:All H3D plans achieved at least 25% lower lung volume at 20 Gy ($14.8\% \pm 8.3\%$) compared to 3DCRT plans ($19.9\% \pm 9.7\%$). Liver V30 was 40% lower in H3D plans ($11.6\% \pm 4.9\%$ vs $17.8\% \pm 7.0\%$). H3D plans also lowered heart V30 by 10% (26.3% vs 30.3%) and heart V40 by 19% (15.1% vs 18.9%). Dose to 1% of cord receiving highest dose was 10% lower (31.14Gy vs 34.68Gy). The treatment time for H3D was approximately 6 minutes for an average target length of 16cm, comparable to 3DCRT. The indices where DCRT fared slightly better were lung V5(49.2% vs 64.7%), V10(39.5% vs 51.7%) and kidney V20 (10.2% vs 11.1%).

Conclusions:H3D produces viable treatment plans, compared to traditional 3DCRT. H3D plans were significantly better in terms of lung V20, heart V30 & V40, maximum cord dose and liver V30. Kidney, lung V5 and V10 are slightly worse compared to 3DCRT.