

Purpose:To quantify the anatomic variations and the actual dosimetric effects by a deformable registration method throughout the entire course of simultaneous integrated boost intensity-modulated radiotherapy (SIB-IMRT) and to assess the necessity of re-planning for patients with nasopharyngeal carcinoma (NPC) .

Methods:Twelve patients with locally advanced NPC treated with SIB-IMRT were enrolled in this pilot study. Plan1(CT1) was based on the original CT scan, while Plan2(CT2) was generated from the mid-treatment CT scan(CT2), which was acquired after 20-25 fractions of IMRT of Plan1. Both sets of CTs, RTstructures and RTdoses for the two plans were transferred to MIMsoftware(V5.1) workstation, and then hybrid IMRT plan, Plan1 (CT2), was generated by deforming RTdose of Plan1 to CT2 allowing for visualizing the dose that had been delivered on the current anatomy. In additional, the accumulated plan, Plan1+2 (CT2), was generated to quantify the actual dosimetric effects during the course of treatment.

Results:Compared to CT1, the volumes of the parotid glands decreased and planning target volumes of PGTV, PTV2 and PTV3 reduced. In Plan1(CT2) and Plan1+2(CT2), the dose to 95% of PGTV decreased, the maximum dose (Dmax) to the spinal cord and the brainstem and the mean dose(Dmean) to the parotid gland increased compared to Plan1(CT1). Our data demonstrated that without repeat imaging and replanning, the dose to target reduced and the dose to critical structures increased.

Conclusions:During the course of IMRT for patients with NPC, the volumes of targets and parotid glands reduced significantly. Mid-treatment CT scanning and replanning were recommend to ensure adequate doses to the targets and safe doses to the critical normal tissues.