

Purpose:

To compare tumor shrinkage in IMRT and proton therapy for locally advanced non-small cell lung cancer.

Methods:

Twenty-four patients enrolled in randomized clinical trial were selected in this study. Patients were randomly assigned to either IMRT or proton therapy when adequate target coverage and mean lung dose constraints can be met. The relative biological effectiveness (RBE) for proton therapy was assumed to be 1.1. There are three prescription dose levels allowed by the protocol, but all patients selected for this analysis received 74 Gy (RBE) in 37 fractions. All patients received weekly 4DCT scans to assess their anatomical changes. To minimize the impact of motion, the primary gross tumor volume (GTVp) and clinical target volume (CTV) were defined on the expiration phase of the 4DCT. In-house developed deformable registration software was used to propagate the planning GTVp and CTV to the end of expiration phase of weekly 4DCT scans. One proton patient received breath-hold gated treatment and the target volumes were assessed on the breath-hold weekly CT. To minimize the impact of variable time delay between simulation and the start of treatment, we normalized tumor shrinkages to the first available weekly 4DCT, assuming no drastic change during the first week of treatment.

Results:

Although individual patient exhibited quite different shrinkage patterns, the average shrinkage for each treatment group was strikingly similar. The average GTVp shrinkage was 23% in IMRT and 23% in Proton at the end of treatment. The average CTV shrinkage was 11% in IMRT and 8% in Proton, respectively.

Conclusions:

The average tumor shrinkage for patients receiving proton therapy and IMRT was remarkably similar, suggesting the adequacy of using RBE value of 1.1 for lung cancer proton therapy.

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No conflict of interest.