

Analysis of Factors Associated with Intrafraction Setup Error during Stereotactic Body Radiotherapy

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Abstract

Stereotactic body radiation therapy (SBRT) is characterized by using fewer treatment fractions and higher fraction size (3 to 15 times more intense than conventional radiation) for small tumor. Therefore it is very important to incorporate the image guidance procedure to increase the accuracy of the treatment delivery. This study enrolled 14 patients undergoing SBRT for lung tumors and bone metastases. The performance status (PS) and immobilization method were recorded. We use the linear accelerator (Elekta Synergy®, UK) with on board cone-beam CT to ensure the patient setup error at various time point (localization、verification、intrafraction、post-treatment). The result showed a significant difference in the Z-axis 20 minutes after starting SBRT ($P < 0.05$). However, the error is less than 1mm though, and is not considered to be clinically significant. We use 4 different immobilization methods, including vacuum bag alone, vacuum bag plus knee support, vacuum bag plus abdominal compression plate, and vacuum bag plus abdominal compression plate and knee support. The analyses revealed that the intrafraction setup error was not significant associated with different immobilization methods ($P > 0.05$) or different PS ($P > 0.05$), possibly due to most patients have performance status of 0-1 with the appropriate immobilization to increase stability and reproducibility. In conclusion, for patients with low pain score, performance status < 1 , and suitable immobilization, imaging by cone-beam CT with every 10-minutes interval is more than adequate to ensure accuracy during SBRT treatment.

Keywords: Stereotactic Body Radiation Therapy, Image Guidance, Setup Error