Dosimetric Impact of Daily Setup Variations during Spine Radiosurgery

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Abstract

To examine the dosimetric stability against geometrical variations in the treatment plan of spine radiosurgery, the positioning data of CBCT image guidance for 28 patients were used to make a comparison between the treatment plans before and after image guidance. The dose distribution in treatment plans were recalculated with the same IMRT fluence map and the CT image shifted by the correction values. Some dosimetric parameters were employed to verify the tumor coverage and the spinal cord dose in the treatment plans. The Target volume which receive more than 95% of prescription dose(D95) for tumors and the equivalent uniform dose (EUD)for spinal cord were calculated to fish out the dosimetric variations. The relation between the tumor coverage and the geometric variations presents to be quadratic in all directions, while the EUD of spinal cord are linearly increased by geometrical variations in anterior-posterior direction in which tumors are located in the view of spinal cord. Since there is no margin at the interface of tumor and spinal cord in most cases, the dosimetric effect of geometrical variation for spinal cord is significant. The tolerance dose of spinal cord in radiosurgery have to be considered very carefully with this dosimetric stability and the geometrical uncertainties.