Editor's Comment:

This study is ready for publication.

The radiation dose to organs outside the treatment field can be significant, the authors considered it to be of clinical interest. Therefore, to estimate the peripheral doses (PD) during stereotactic radiosurgery using the Leksell Gamma Knife for the single isocenter treatment technique in particular, the entire treatment plan can be described as part of the method. Knowledge of the PD can be effectively used to optimize treatment planning to deliver a very precise radiation dose to a well-defined target with minimal damage to surrounding healthy tissue and other organs. Moreover, the PD can be a limiting factor during the treatment of some non-malignant tumors or in pregnant women. The Alderson-Rando phantom was used for PD measurements. A dose of 40 Gy was delivered in a single-fraction radiosurgery to a hypothetical midline target volume located close to the caval center. Treatment planning for a single target covered by 50% isodose of each collimator was performed using the Leksell Gamma Plan treatment planning system. The authors generated treatment plans for one, 5, 10, 15, 20 and 25 shots, maintaining the same position and doses. An automatic positioning system (APS) was used to position the phantom during treatment. Doses to different organs were measured during treatment using a thermoluminescent dosimeter (TL). In conclusion, the authors concluded that the number of shots as well as the collimator size affect the PD value. Reducing the number of shots can reduce the PD for sites distant from the target with a minimal or insignificant effect on the prescribed dose. The data are confirmed by the graphs. Thus, the risk is reduced when the subject of protection is pregnant women, if treatment is unavoidable or the patient is in productive age, on the other hand, the effect of the collimator size is more significant for organs close to the target. The proposed weighting of the effect of collimator size and number of shots can be effectively used during the optimization procedure to select the most appropriate treatment plan.

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