

Single Center Study of Clinical Dosimetry Data Characteristics and Quality Assurance of Robotic Radiosurgery

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Abstract

Objectives: The clinical dosimetry data characteristics and quality assurance commissioning procedure of VSI Cyberknife was studied in this research.

Methods: Combining the practical operating experience, a comparative analysis was carried retrospectively on clinical reference data supplied by Accuray Incorporated and the clinical commissioning data of VSI Cyberknife which installed in our center in July 2017. Except for off-center ratios, the clinical dosimetry data were measured used by PTW 60019.

Results: It was pointed out that the analysis of Auto quality assurance and End-to-End test should balance of its eccentricity, three-dimensional error and the total radial error. Both radiochromic film and equivalently high spatial resolution detector could be used for Iris QA, but the use of radiochromic film was strongly recommended when the baseline set of measurement was done. At 650mm, 800mm and 1000mm SAD, the average deviation between measurements and reference value for output factors across all Fixed size cones were -1.27%, -0.21% and 0.70%, respectively. And for 5/7.5 mm collimators, the values were -5.10%/-2.67%, -2.08%/-1.41% and -1.12%/0.06%, respectively. For Iris apertures, the values were 1.88%, -0.74%, 0.09%, -8.61%/-3.53%, -4.38%/-1.97% and -1.34%/-0.33%, respectively. At the surface of water, the mean value of tissue phantom ratios of two types of collimator were -6.22% of Fixed vs -4.81% of Iris, respectively, both less than reference values. Except for 5mm and 7.5mm Iris collimators, the measurement curves of off-center ratios for those two types of collimators had a tendency that the shoulder and bottom of curves toward positive deviation, and the deviation was more obvious with the increase of collimator sizes. The output of dose calibration for IAEA TRS 277 was about two percent smaller than that of TRS 398.

Conclusions: In acceptance procedure of Cyberknife, the characteristics of two types collimators especially for smaller collimators should be considered adequately, the user should choose the appropriate commissioning procedures.

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Abstract

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