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Abstract

A Strategy for Mining Function of Sensitive Variables for Clinical Evaluation based on Spine Stereotactic Radiosurgery Case Pool

Kaile Li [1]

1. Radiation Oncology, John R Marsh Cancer Center

Corresponding author: Kaile Li, goolkl@gmail.com

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Abstract

Objectives: Stereotactic Radiosurgery (SRS) procedure included simulation, target definition, treatment planning, treatment target localization, and dose delivery. Each setup involved different level of decision-making function of different variables. In this study, in order to develop a single number clinical decision-making system, a two-level overlapping method was employed to analyze the sensitivity of different dosimetric decision-making functions based on spine SRS treatment plans.

Methods: There were 8 cases of spine SRS selected for this study. The locations of the targets range from thoracic and lumbar positions. The treatment planning setting parameters were defined in Eclipse external beam treatment planning system. The parameters selected for this study were based on different features such as apparatus, algorithm, calculation resolution, and radiation beam data. For the dosimetric characteristics, the selected parameters were integrated index, conformity index, spillage level, critical structure dose index and homogeneity index. All index values were computed as ratio. And the accumulated scores for individual case were expressed dimensional conversion algorithms, which were sum, product, geometric mean and harmonic mean for all these indexes.

Results: For all selected spine SRS cases, the average sum score was 6.59 with percentage standard deviation at 1.3%, average product was 1.94 with percentage standard deviation at 3.7%, average geometric mean was 1.50 with percentage standard deviation at 1.4%, and average harmonic mean was 1.36 with percentage standard deviation at 1.8%.

Conclusions: After computed several numerical decision-making functions based on the combination of dosimetry parameter sets from limit spine SRS cases, the sum score gave the large value, and the harmonic score showed the minimum amplitude. A pure numerical system for plan evaluation could be developed with more independent parameters such as geometric settings being included; moreover, SRS for other disease sites could also be studied to correlate a single number with clinical outcome.

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