

The Best Tracking Option for First Three Cervical Spinal Radiosurgery with CyberKnife: 6D Skull or X-Sight Spine

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Abstract

Objectives: Proximity Detection Program (PDP) error is observed at 2nd and 3rd cervical levels in some treatments with 6D-skull. The possibility of occurrence of this error decreases significantly in X-sight spine technique. In this study, we dosimetrically compared two different tracking techniques in Alderson Rando phantom.

Methods: Thermoluminescent dosimeter (TLD 100) chips were used to measure radiation dose and inserted in the level of 1st, 2nd and 3rd cervical vertebrae of an Alderson Rando anthropomorphic phantom and Computerized Tomography images were acquired. The first three vertebrae were contoured as separate targets and they all were planned homogeneously with 6D-skull and X-sight spine tracking techniques in MultiPlan. All 6 plans were calculated with a 0.5 uncertainty in Monte Carlo algorithm. 600 cGy was prescribed for each target. After the irradiation each TLD 100 is read and a coefficient was determined. Treatment and reading of the TLD 100s are repeated for 3 times and results were compared for each level of vertebrae in two different tracking techniques.

Results: No PDP error has been observed in 1st cervical spinal irradiation and all irradiation for this setting has been completed in 6D-skull tracking technique. We received PDP error 3 times in 2nd cervical vertebrae irradiation, but we could finish the planned irradiation. In 3rd cervical vertebrae irradiation we could not finish the irradiation due to PDP error. All irradiation were done without any error message in X-sight Spine tracking technique. The average results of measured TLD 100s that were inserted in 1st and 2nd vertebrae were 550 cGy (range 529-574), 638 (range 623-650) respectively in 6D-skull tracking technique. We also measured 545 cGy (range 520-560), 679 cGy (range 650-723) and 611 cGy (range 590-640) in 1st, 2nd and 3rd vertebrae respectively in X-sight Spine tracking technique.

Conclusions: X-sight spine is the proper tracking technique instead of 6D-skull for avoiding PDP error and treatment quality in cervical spinal radiosurgery.

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Abstract

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