

Purpose:

The purpose of this study is to analyze the positioning accuracy of the Robotics couch¹ for longitudinal and lateral rotations and to compare the accuracy of the frameless with the frame-based radiosurgery technique.

Materials and methods:

A head phantom with seven lead beads inserted was used for this study. A software tool was developed in-house to rotate the reference CT images up to 4degrees in the positive and negative direction and for both the rotation around the longitudinal and lateral axis. The angles measured by ExacTrac were compared to the known rotations. The accuracy of the positioning of the phantom based on the rotated images was measured with a digital waterlevel and portal films.

Multiple hidden target tests (HTT) were performed to measure the accuracy of the 2 positioning techniques for radiosurgery.

Results:

The difference between the angles measured with ExacTrac and the known angles introduced with the in-house program, was 0.03° (SD0.04°) and 0.14° (SD0.06°), for longitudinal and lateral rotations. The positioning error of the Robotics couch measured with the digital waterlevel was 0.01° (SD0.04°) for both longitudinal and lateral rotations. With the portal films, the positioning error was 0.01° (SD0.06°) and 0.04° (SD0.05°), for longitudinal and lateral rotations, respectively.

The overall 3D accuracy defined by the HTT was 1.19mm (SD0.45mm) and 0.87mm (SD0.59mm) for the frame-based and frameless techniques, respectively.

Conclusions:

The study showed a high detection accuracy and a sub-degree positioning accuracy for the Robotics couch. Comparable accuracy with a small advantage for the frameless technique to the frame-based radiosurgery technique was found.

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