AbstractID: 3532 Title: A New Linac QA Procedure for the Characterization of Radiation Isocenter and Room Lasers Position

Purpose

We have designed and implemented a new stereotactic machine QA test. The method is used to characterize gantry sag, couch wobble, cone placement, MLC offset and room lasers position relative to radiation isocenter. An image containing a series of test patterns is generated in a direct and integrated fashion.

Method and Materials

Two MLC star patterns, a cone pattern and the laser lines are recorded on the same imaging medium, enabling 0.1 mm accuracy measurements. Phosphor plates are used as the imaging medium due to their unique property that the red light of wall laser erases the radiation information stored on phosphor plates. The room lasers position relative to the radiation isocenter can be measured.

The developed QA method consists of four images that measure the gantry sag between 0^0 and 180^0 gantry angles, the position and stability of couch rotational axis, the sag between 90^0 and 270^0 gantry angles, the accuracy of cone placement on the collimator and the position of laser lines relative radiation isocenter.

Results

The inherent precision of the numerical algorithms developed is +/- 0.05mm. The inherent accuracy of the method as a whole is +/- 0.1mm. The total irradiation/illumination time is about 10 min per image. Automating the generation of collimator star patterns can reduce this time. The data analysis (including the phosphor plate scanning) is less than 5min.

Conclusions

The presented method reproducibly characterizes the radiation isocenter geometry with the high accuracy required for stereotactic surgery. It can replace the standard ball test and it can provide a highly accurate QA procedure for the non-stereotactic machines.