AbstractID: 7469 Title: Automated Stereotactic Radiosurgery Quality Assurance Using a Portal Imager

Purpose: An automated portal vision based quality assurance method is implemented to replace the labor intensive manual used to ensure the collimator alignment accuracy prior to performing stereotactic radiosurgery.

Method and Materials: We use Varian PortalVision™ EPID on a Varian Trilogy™ linear accelerator to acquire the projection images of an isocentrically-placed tungsten sphere produced during Winston-Lutz Alignment Test that includes multiple gantry and couch combinations. The analysis routine applied to each acquired image consists of 1) search for the sphere and collimator edges 2) fitting them to a circle and 3) calculation of distance between the collimator and sphere optimized center points. The method, based on the properties of pseudo-inverse matrices, is implemented to calculate the cumulative 3D shift of the sphere center relative to the isocenter of the Trilogy machine. The graphic interface was created using MatLab™ that permits the choice of the type of the QA procedure (daily or weekly), performs image analysis and allows visual examination, saving and printing of the results.

Results: The in-house software was tested in 17 trials by comparing it to the conventional SRS QA technique based on film image acquisition with subsequent manual shift measurements. The calculated mean of the difference between film and portal vision – based methods was: 0.07 ± 0.11mm vertical,-0.11 ± 0.17mm lateral, 0.02 ± 0.08 mm longitudinal shift components. The mean of 0.11 ± 0.13 mm was shown for the absolute value of the vector shift differences in 3D.

Conclusion: The automated QA procedure for SRS LINAC QA is created, tested and proven to be fast, precise and efficient replacement for the conventional film-based quality assurance technique. The use of the presented routine should allow more frequent SRS QA tests, which ensures high accuracy and quality of the patient treatments.

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