

AbstractID: 11475 Title: Ball-cube II: a new film-based QA tool to characterize stereotactic dose delivery

**Purpose:** To evaluate Ball-cube II (Accuray Incorporated, Sunnyvale, CA), an improved film-based QA tool for Stereotactic Radiosurgery (SRS). **Method and Materials:** Ball-cube II consists of four plastic sections connected together with clips. It accommodates two pieces of radiochromic EBT film (ISP Corporation, Wayne, NJ) in orthogonal planes. The primary advantage of Ball-cube II over its predecessor "Ball-cube I" is that it has four 0.1 inch (2.54 mm) film alignment posts, which when used with matching laser cut film lead to a precise and reproducible fit, thus minimizing errors due to film positioning. The alignment posts also have embedded copper markers to allow automatic registration of the film with the RT dose distribution. These markers are sufficiently visible to be located in the CT image, but are small enough to distinguish them from embedded gold fiducials used for patient alignment and tracking. Ball-cube II has additional improvements, e.g., nylon nuts in the original design were replaced with clips, which enables easier and faster loading of the film and eliminates the possibility of over tightening the screws, which can cause the film to darken. The cube sits in an anthropomorphic head phantom and can be tracked using either the embedded gold fiducials or bony anatomy. The phantom treatment process is performed just as with a patient: CT image acquisition, treatment planning and phantom irradiation. The films are analyzed to compute spatial targeting error. Ball-cube II and its predecessor were compared by performing 10 spatial targeting tests for each. **Results:** The mean targeting error is equivalent (0.40 vs. 0.39 mm), but the standard deviation is 46% smaller for Ball-cube II (0.07 vs. 0.13 mm). **Conclusion:** The Ball-cube II design reduces uncertainty in film analysis with precise film positioning and automatic dose-to-film registration.

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