Purpose: To present EBT2 film verification of treatment planning with the eXtend System, a relocatable frame system for multiple-fraction or serial multiple-session radiosurgery.

Methods: A human head shaped phantom simulated the verification process for fractionated Gamma Knife (GK) treatment. Phantom preparation for eXtend Frame based treatment planning involved creating a dental impression, fitting the phantom to the frame system, acquiring a stereotactic computed tomography (CT) scan. A CT scan (Siemens, Emotion6) of the phantom was obtained with following parameters: Tube Voltage - 110 kV, Tube Current - 280 mA, pixel size - 0.5 mm x 0.5 mm and 1 mm slice thickness. A treatment plan with two 8 mm collimator shots and three sector blocking in each shot was made. Dose prescription of 4.0 Gy at 100% was delivered for the first fraction out of the two fractions planned. Gafchromic EBT2 film (ISP Wayne, NJ) was used as 2D verification dosimeter in this process. Films were cut and placed inside the film insert of the phantom for treatment dose delivery. Meanwhile a set of films from the same batch were exposed from 0 Gy to 12 Gy doses for calibration purpose. EPSON (Expression 10000XL) scanner was used for scanning the exposed films in transparency mode. Scanned films were analyzed with in-house made Matlab codes.

Results: Gamma index analysis of film measurement in comparison with TPS calculated dose resulted in high pass rates >90% for different tolerance criteria of 2%/2mm, 1%/1mm, and 0.5%/0.5mm. The isodose overlay and linear dose profiles of film measured and computed dose distribution on sagittal and coronal plane was in close agreement.

Conclusions: Through this study we propose a treatment verification QA method for eXtend frame based fractionated Gamma Knife radiosurgery using EBT2 film.

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