characteristics, accuracy, and system components have previously been reported (1,2). Calibration data were conducted with 6MV photons and 6–16 MeV electron energies in a phantom and showed approximately a 1:1 correlation with slight dependency on electron energy. Data was obtained on 24 patients (part of FDA approved pilot and pivotal studies on DVS) receiving electron boost breast treatments. Each patient (pt) had one dosimeter implanted in the tumor bed and one in normal tissue in the opposite quadrant of the breast. Radiation dose was calculated and prescribed to a point at depth in the tumor bed. Daily dose measurements from the DVS for the electron boost treatments were recorded and compared with the predicted dose values at the MOSFET position for each dosimeter location.

Results: Dosimeters implanted in the *tumor bed* were close to the 180 cGy electron dose prescription. The frequency of measured to expected dose variability of $>\pm 7\%$ was found in 13 out of the 24 patients (6 of the 13 pts had dose variability in the range $>\pm 15\%$). Dose measurements were obtained from the dosimeter implanted in *normal tissue* for all patients and measurable data was obtained in 6 pts. For dosimeters in or at the edge of the field (4 pts), the measured dose was in the range of 68–184 cGy vs. an expected dose >180 cGy. Surprisingly, dosimeters located outside the field recorded doses in the range of 64 cGy compared to a expected dose of 0.0 cGy. This large variability is indicative of possible setup errors or target movement during treatment as daily dose measurements varied widely in individual patients.

Conclusions: The DVS was able to measure electron dose for breast boost patients. A majority of patients had >7% variability between predicted and measured dose. The dosimeter has the potential to help evaluate the daily dose delivered, quantify the accuracy of electron dose calculations, quantify the effects of daily intra- and inter- fractional motion and verify small field margin accuracy (such as partial breast irradiation). The variance noted with electron boost doses suggests an important role for DVS to improve consistency and accuracy of electron dose delivery for breast patients.

1. Int J Rad Onc Bio Phys, 62 (2), pp 606–613, 2005.
2. Phys Med Biol, 50, pp 141–149, 2005.

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2912 Performance Study of and Optoelectronic Localization System for Functional Proton Radiosurgery

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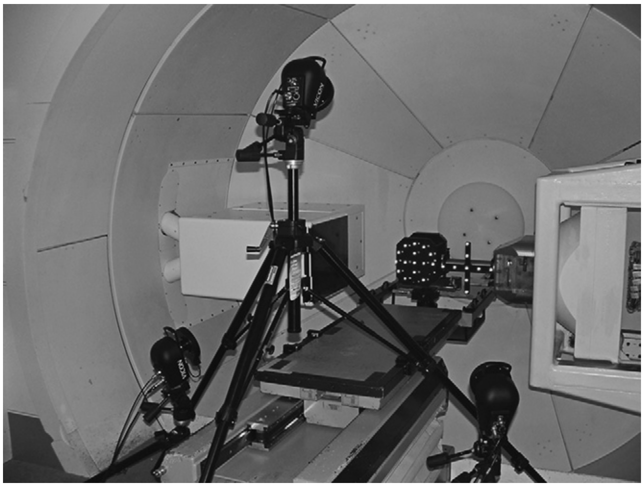
Purpose/Objective(s): To study the performance of an optoelectronic localization system (OLS) with three high-resolution cameras and passive retroreflective markers for potential application in positioning and alignment control in functional proton radiosurgery.

Materials/Methods: The Vicon system (Vicon 260, Vicon Motion Systems, Ltd, Oxford, UK) was used as the OLS. A set of 15 retroreflective spherical markers (6 mm diameter) was attached to a stereotactic halo (Leksell G frame, Elekta Instruments, Stockholm, Sweden) and captured repeatedly. We tested the accuracy of the system by performing distance measurements of each marker from the center of gravity of all other markers, which were compared to the distances measured by a certified metrology laboratory to better than 0.025 mm. Before each measurement session. the system was calibrated with a static marker frame and dynamic wand movements. Within each session 17–18 data individual data captures were performed. Two different camera configurations and four different dynamic calibration techniques were tested (Fig.).

Results: The standard deviation of the measurement error (95% confidence interval) were 0.16 mm (0.12 mm, 0.26 mm) for the first camera configuration for which the camera axes met at an acute angle of about 50 deg at isocenter, and 0.24 mm (0.19 mm, 0.38 mm) for the second camera configuration for which the camera axes met at 90-deg angles. Different calibration techniques did not influence the accuracy. ANOVA showed that marker variation and intersession variations were the largest components of the variation and that the two camera configurations differed with respect to the intersession variance but not the residual error and the marker variance.

Conclusions: The Vicon system appears appropriate for localizing passive markers in space with better than 0.4 mm resolution. System performance can be further improved by careful marker selection.



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