The goal of this study was to evaluate two different film dosimeters and two different film densitometry devices for small x-ray beam dosimetry. We irradiated radiochromic film and an extended dose range radiographic film with our Gamma Knife unit, using a spherical phantom. Dose profiles in the X, Y and Z directions were measured for all four collimator helmets for the Gamma Knife. The radiochromic film was read out with two different film densitometers, a 660 nm wavelength radiochromic densitometer operated manually, and a Vidar VX16 Dosimetry pro film scanner. The EDR film was read with the Vidar scanner only. The measured optical densities were processed using commercially available film data analysis software, and appropriate corrections were made for non-linearity in dose response for each film. The measured dose profiles were compared with the absorbed dose profiles extracted from the Gamma Plan treatment planning software calculated using the data provided by the manufacturer. The evaluation of the dose profiles were made by comparing plots of the above four profiles for each direction for each helmet, and by comparing the 50% widths and the size of the penumbra (80% to 20%) for each side of each profile.

Our results show excellent agreement between all the measured profiles with the data provided by the manufacturer. This indicates that the cheaper EDR film and the use of an automatic film scanner with a high enough resolution can be used to obtain as accurate a dose measurement for small beams as radiochromic films.