

Feasibility study of utilizing a portable spectrophotometer to assess the radiation dose delivered to the radiochromic film

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Purpose: This study aims to show the feasibility of portable spectrophotometers to assess the doses delivered to the radiochromic film and to compare the results with those by the flatbed scanner.

Materials and Methods: The 6 MV photon beam from a TrueBeam STx machine was used to deliver 0 to 2000 cGy to the EBT3 films. After the irradiation, the films were analyzed by using the two portable spectrophotometers and a flatbed scanner (EPSON 10000XL). X-Rite eXact Advanced and YS-3020 were used to measure the reflected light from the radiochromic films of which size was 10 × 12 mm². Since the portable spectrophotometers had different size of apertures, the different size of a region of interest (ROI) were selected. A 3 mm diameter circular area, 1 × 3 mm² area, and 2 × 2 mm² area were the selected ROIs of eXact Advanced, YS-3020, and the flatbed scanner, respectively. The dose response curves were derived from the measurements in terms of net optical density (netOD). The sensitivity results were compared between the two spectrophotometers and flatbed scanner.

Results: The standard-red channel of eXact Advanced device showed the most sensitive curve in the netOD of the EBT3. The standard-red channel of YS-3020 device showed the similar levels of sensitivity with the EPSON 10000XL scanner.

Conclusions: The eXact Advanced showed higher sensitivity than that of the flatbed scanner, and YS-3020 showed similar levels of sensitivity with the flatbed scanner. Utilization of portable spectrometers to evaluate the dose of the radiochromic film is expected to be used especially for the fast and *in situ* analysis of irradiated film.

Keywords: Portable spectrophotometer, radiochromic films, flatbed scanner, in situ analysis