Purpose: To evaluate the suitability of GafChromic RTQA film for use in head leakage tests and to summarize the advantages/disadvantages of using radiochromic film over traditional radiographic film.

Methods: Head leakage tests were conducted on a recently installed Varian 21iX treatment machine. 50 sheets (5 boxes) of 14” by 17” GafChromic RTQA film (International Specialty Products) were affixed to the accelerator head with the clear top substrate facing outwards. Leakage tests were performed with a 6 MV photon beam and the smallest possible field, ~2 mm x ~2 mm. GafChromic film self-develops, and areas of leakage were identified without removing the film or pre-determining the number of monitor units. The film was evaluated after delivery of 10,000 MU, 30,000 MU, and 60,000 MU (100 Gy, 300 Gy and 600 Gy respectively to isocenter).

Results: Evidence of leakage radiation was faintly visible after 10,000 MU and clearly visible after 30,000 MU. Survey meter measurements confirmed that the highest leakage occurs at the regions identified by the GafChromic film. The comparison between GafChromic RTQA film and traditionally-used photographic film can be summarized as an exchange between cost, time, and simplicity. Total retail cost for the GafChromic film used in these measurements was approximately $1200, which is substantially more expensive than radiographic film (approximately $100). Time savings of the GafChromic method was approximately one full workday. GafChromic film was the simpler option for head leakage testing. GafChromic film provides immediate feedback and requires no darkroom, no MU estimation, and no need for film numbering or indexing.

Conclusions: This work indicates that, based on time savings and the ease of use, GafChromic RTQA film is a suitable alternative to radiographic film in identifying areas of head leakage.