Introduction

The Imaging and Radiation Oncology Core Houston Quality Assurance Center (IROC-H) conducts external audits for output check verification of photon and electron beams on an annual base. The program is based on mailable detectors and miniphantoms. Many of the beams checked can meet the geometric requirements of the TG-51 calibration protocol. Those beams that do not meet the requirements are called TG-51 non-compliant beams. Examples that are evaluated in this work are Elekta GammaKnife, Accuray CyberKnife and TomoTherapy units. IROC-H has designed specific audit tools to monitor the reference calibration of these units.

Methods and Material (cont’d)

The calculation of dose is based on the readings from the detectors, calibration of the system based on a reference dose and energy (3 Gy and 60Co, respectively) and corrections factors to take into account changes in the signal because of dose level, energy, fading and irradiation geometries. Dose calculations are performed using the IROC-H database.

Results (cont’d)

These ratios have shown some changes compared to values presented in 2008. The GammaKnife results were corrected by an experimental determined scatter factor of 1.025 in 2013. There are no changes in the evaluation of irradiation on Cyberknife. The TomoTherapy results are now only from a rotational beam whereas in 2008 the results were from static beams only. The decision to change from static to a rotational modality was based on recommendations from the users. The average ratio was evaluated under different conditions. The results presented in figure 1 are for all units (HiArt and HD) and the overall ratio for HD units is 0.977±0.022. The average for the checks done during 2015 has increased by almost 1% compared to historical values.

Results

The average IROC-H/institution ratios for 480 GammaKnife, 660 CyberKnife and 907 rotational TomoTherapy beams are 1.000±0.021, 1.008±0.019, 0.974±0.023, respectively.

Conclusions

External audits of beam outputs is a valuable tool to confirm the calibrations of photon beams regardless whether the machine is TG-51 or TG 51 non-compliant. The difference found for TomoTherapy units is under investigation.

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