AbstractID: 10379 Title: Evaluation of a self-contained orthovoltage x-ray unit

Purpose:

Orthovoltage x-ray units, designed for non-human use, are rapidly replacing radioisotope irradiators in small animal and radiobiology research. The beam characteristics of these units, however, are often ignored by researchers. This work characterizes the orthovolatge beam from one of the newer units widely used by researchers in medicine and related fields.

Method and Materials:

The X-Rad 320, a self-contained x-ray system is commonly used in laboratory and university settings. The unit has a maximum output voltage of 320 kVp and a maximum dose output of 3 Gy/min at 50 cm SSD. The kVp and mA settings are adjustable through a wide range and the SSD can be set between 20 and 90 cm.

This work characterizes the beam produced by this system with regard to its flatness, depth dose, collimator scatter factor, and backscatter factor at the location of its adjustable height sample shelf. The validity of the inverse square factor and the accuracy of HVL determination in this system's enclosed environment are also examined.

Results:

The unit has been calibrated according to AAPM TG-61 protocol. HVLs for certain beam settings have been determined and depth dose has been measured and compared to published data for the appropriate beam quality. The flatness of the beam for several collimator settings has been measured to ensure uniform irradiation of samples within a given collimator setting. Other beam characteristics such as backscatter and collimator scatter factors have also been measured.

Conclusion:

Proper characterization of an x-ray beam and accurate dosimetry is of importance in many of the small animal and radiobiology investigations which may lead to advent of new therapies for humans. This work investigates the beam characteristics of a self-contained orthovoltage x-ray unit to ensure accurate and uniform irradiation of samples.