

AbstractID: 8561 Title: Absolute Dose Determination of Helical Tomotherapy: Comparison between Several Methods

Purpose:

A helical tomotherapy accelerator has been commissioned last year in Switzerland at Lausanne University Hospital (CHUV). Despite the fact that more than 150 such instruments have already been sold around the world, this technique presents a dosimetric challenge and there is no internationally accepted protocol for the reference dose yet. The goal of the present study is to investigate different alternatives to have an independent method to determine the dose reference of the accelerator.

Method and Materials:

Several dosimetric techniques with various metrological traceabilities were tested in a number of phantoms in static and helical modes. The first measurements were performed with the A1SL ionization chamber, which is delivered by the vendor as a reference instrument: it is traceable to the American national metrology institute (NIST) in absorbed dose to water in a Co-60 beam quality through a graphite calorimeter. In Switzerland, each radiotherapy department is directly traceable to the national standard (METAS) in absorbed dose to water through a water calorimeter. A NE 2611A ionization chamber calibrated by METAS was therefore used to determine the reference dose as well. In order to have another fully independent way of measurement, the reference dose was also determined by mean of alanine dosimeters provided by the British national laboratory (NPL) and calibrated in absorbed dose to water through a graphite calorimeter. Finally, in order to take into account one of the chamber that is widely used in the clinical practice, the reference dose was also measured using a Farmer-type instrument (NE 2571).

Conclusion:

Compared to our standard (NE 2611A), the A1SL, alanine and Farmer chamber (NE 2571) showed differences of 1.2 %, -0.4 % and -1.7 % respectively. These values are within the measurements uncertainty of the different methods and can be partially explained by the design of the chambers.