

AbstractID: 10472 Title: Stability assessment of MVCT imaging for dose calculation purposes

Background and purpose : Using Helical Tomotherapy (HT) it is possible to acquire MVCT images of the patient prior to treatment to position the patient. Previous studies have shown that it is possible to use these images for dose calculation, given the exact Image-value-to-density conversion table (IVDT). However, in a clinical setting the image quality is susceptible to changing noise levels, base-line shifts with output changes and beam spectrum changes, which also have an influence on the IVDT. The aim of this study is to investigate the stability of these images when used for dose calculation in function of varying machine output, beam energy and component changes, and to develop and test a rigid and fast QA protocol that can be used in clinical routine for these images.

Material and Methods : The effect of output and energy changes on the IVDT was measured for clinically observed output and energy changes, and the effect on the dose calculation was measured using phantom calculations. Measurements on image characteristics were also performed before and after magnetron and target changes. To be able to build a QA protocol output/energy effects were linked to image quality and noise levels.

Results : Clinical variations in output and energy of the beam lead to variations in the IVDT of up to 5% and differences in dose calculation on phantom of up to 3%. Measurements show the noise level of the images can be used as test for changes in the IVDT and that changing a magnetron or target can completely alter the IVDT characteristics. A QA schedule of acquiring one IVDT every week is proposed.

Conclusion : Even though studies have shown that dose calculation on tomotherapy-MVCT images is feasible, the use of this in clinical routine is only possible when combined with a strict imaging-QA-protocol.