

AbstractID: 2884 Title: IMRT Pre-Treatment Verification with Ionization Chamber, Film and EPID: Quality vs. Time Consumption

Purpose:

The objective of this study was to obtain a standard IMRT pre-treatment verification protocol based on both quality and time-consumption parameters. A further objective was to define pass/fail criteria for the protocol.

Method and Materials:

Three existing pre-treatment verification methods were compared. 1) Total plan dose verification in a PVC slab phantom with an ionization chamber. 2) Total plan dose verification in PVC slab phantom with Kodak EDR2 film. 3) Single beam dose verification with the Siemens Optivue 500/1000 EPID. A prostate and head and neck plan were made with the XiO 4.2 IMRT TPS to evaluate quality (reproducibility and potential to detect significant errors) and time-consumption for each method. To evaluate reproducibility the plans were measured 10 times. The potential to detect errors was measured by introducing errors in the delivery by changing the number of monitor units, deletion of segments and MLC misalignment. For the time-consumption, measurement and analysis time were registered. A MATLAB tool was written to perform the analysis. Use of the gamma-index with different values for the dose difference percentage and distance to agreement was evaluated for methods 2 and 3. For the single beam dose verification method an additional criterion was defined and evaluated. This criterion was a combination of the mean percentage dose difference in a beam and the beam weight dependency.

Results:

The MATLAB tool provided a fast and accurate way to analyse the measurements. We were able to show clear differences between the three methods. As expected film verification was the most time consuming method and EPID verification could be performed the quickest, but still with high quality, i.e. reproducible and correct error detection.

Conclusion:

A comparison between the three methods resulted in the definition of a standard IMRT pre-treatment verification protocol with a favorable quality/time-consumption ratio and suitable criteria.