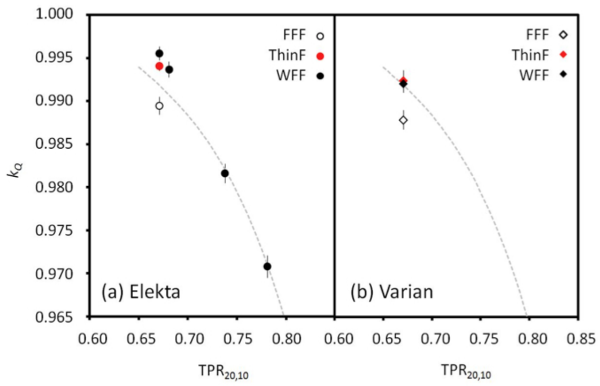

Figure 1 *kQ* of modelled NE2561 chamber with beams with the flattening filter (closed shapes), beams with the flattening filter removed (open shapes) and beams with thin replacement filter (red shapes). (a) shows the results for Elekta beams and (b) shows the results for Varian beams. The dashed grey line shows the average of kQ from TRS-398 and Muir *et al.*

Conclusion: The average difference between linac outputs measured with TRS-398 and TG-51 protocols was less than 0.2 % for 6 MV FFF and 10 MV FFF. Modelling suggests a 2-3 mm metal plate used in place of the flattening filter offers sufficient filtration for the FFF beam to produce a similar *kQ* to WFF beams.

OC-0074

A real time in vivo dosimeter integrated in the radiation protection disc for IORT breast treatment

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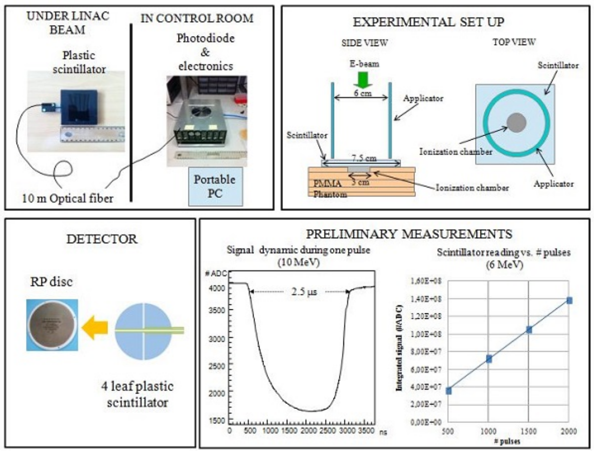
Purpose or Objective: IORT breast carcinoma treatment clinical practice has evidenced the need of real time monitoring the dose delivery on the target. The actual discussion on the efficacy of the technique is mainly related with the effective coverage degree of the whole PTV. Furthermore the correct positioning of the radiation protection with respect to the applicator is a critical aspect that cannot presently be determined in real time. The commercially available in vivo dosimetry technologies allow either a real time measurement in one point (MOSFET type detectors) or a non real time measurement over a surface (radio chromic films). A cooperation between a clinical hospital, a research institute and an industrial company has led to the conceptual design of a new device capable of satisfying the above mentioned needs. Such device has been patented. The new dosimeter consists in four leaf shaped plastic scintillators positioned between the two parts of the radiation protection disc, composed by a PTFE and a steel element (see figure). Therefore such device can measure in real time the dose in the four sectors, providing both the integral dose and a measurement of the field symmetry on the target.

Material and Methods: The accelerator employed is a mobile IORT dedicated electron accelerator capable of producing a 4, 6, 8 and 10 MeV electron beam, collimated by means of PMMA applicators. Measurements have been performed with a prototype based on a plastic scintillator tile placed in a PMMA phantom, with the signal processed and integrated by dedicated electronics. The plastic scintillator data has been compared with the standard dose measurements, performed by means of the PTW Roos ionization chamber and the Unidos E electrometer.

Results: The behavior of the plastic scintillator has been tested with the IORT accelerator electron beam. Several tests have been performed, comparing the reading of the system with the reading of the plane parallel ionization chamber in a PMMA phantom. On the basis of the preliminary measurements, the system fully complies with the standards requirements (see figure).



Conclusion: The above described in vivo dosimeter significantly improves the IORT clinical documentation, allowing the real time check of the dose delivery over the whole PTV. Furthermore, since the device sensitivity is high enough to produce a precise dose map with an overall delivery of less than 1 cGy, the correct positioning of the disc with respect to the PTV and the applicator can be checked before delivering the treatment, allowing the surgeon to correct it should the symmetry on the PTV be out of tolerance levels. The system will be engineered in order to meet the standards required for a temporarily implanted medical device too (biocompatibility, sterilizability, etc.) and will undergo the certification process during 2016. It is planned to organize a multicentre study for verifying in the clinical practice the efficacy and safety of the new dosimeter.

OC-0075

Impact of air around an ion chamber: solid water phantoms not suitable for dosimetry on an MR-linac

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Purpose or Objective: A protocol for reference dosimetry for the MR-linac is under development. The response of an ion chamber must be corrected for the influence of the 1.5T magnetic field as deflection of electron trajectories by the Lorentz force is greater in the air-filled chamber than the surrounding phantom. Solid water (SW) phantoms are used for dosimetry measurements on the MR-linac, but a small volume of air is present between the chamber wall and phantom insert. This study aims to determine if this air volume influences ion chamber measurements on the MR-linac. The variation of chamber response as the chambers were rotated about the longitudinal chamber axis was assessed in SW and water to distinguish between the effect of the anisotropic dose distribution in a magnetic field and any intrinsic anisotropy of the chamber response to radiation. The sensitivity of the chamber response to the distribution of air around the chamber was also investigated.

Material and Methods: Measurements were performed on an MR-linac and replicated on an energy-matched Agility linac for five chambers, comprising three different models. The response of three waterproof chambers was measured with air and with water between the chamber and insert to measure the influence of the air volume on the absolute chamber response. Angular dependence of the waterproof chambers and two NE 2571 chambers was measured in an SW