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## The correction factors estimated for small field's dosimetry by using 6 and 18MV energies of a linear accelerator using on radiation oncology unit

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**Background and purpose:** Small field sizes are increasingly used in radiotherapy to deliver higher dose gradient to patients. Estimating dosimetric parameters for such fields in non-reference conditions based on the conventional protocols used at large fields, as used in the reference condition, lead to significant errors. The primary aim of this study was to determine and compare small fields correction factors (KNR and KNCSF) measured with different types of active detectors using on radiation oncology unit.

**Materials and Methods:** Small field sizes were defined by circular cones down to 30 and 5mm diameters. Then, the KNR and KNCSF correction factors proposed recently for small field dosimetry formalism (TG155 protocol) were determined for different active detectors in a homogeneous as well as a non-homogeneous phantom. The non-homogeneous phantom was designed and made by using Perspex as the soft tissue and appropriate lung and bone tissue equivalent materials. Dosimetric measurements were made by using high resolution diodes (made by Scanditronix), and ionizing chambers (made by PTW). The 6 and 18MV beams were produced by a 2100C/D Varian Clinic linear accelerator system with the circular collimators fixed at its head. The linac output had an output rate of 100 MU/min. Variation of the central axis dose in the 5 and 30 mm small fields, in the inhomogeneous phantom constructed of different inhomogeneous layers (composed of cork and PTFE) for the 6 and 18MV energies was also investigated.

**Results:** The KNR correction factors for the circle field of 30mm estimated for the Pinpoint ionizing chambers, EDP-20 and EDP-10 diodes were 0.993, 1.020 and 1.054 at 6 MV; and 0.992, 1.054 and 1.005 at 18 MV respectively. The KNCSF correction factor for the circle field of 5mm estimated for the Pinpoint ionizing chambers, EDP-20 and EDP-10 diodes were 0.994, 1.023 and 1.040 at 6MV; and 1.000, 1.014 and 1.022 at 18MV respectively. The maximum variation in the percentage depth dose in the non-homogeneous phantom relative to the homogeneous phantom in the 5 and 30 mm field sizes due to the presence of 30mm cork heterogeneity were 23.5 % and the 62.1%, respectively, while the PTFE heterogeneity caused a maximum variation of 8.17%, 7.15% for the 5 and 30 mm field size respectively.

**Conclusion:** Implementing the correction factors based on the new dosimetry protocol proposed for the small fields increases the dosimetric precision and accuracy of small field's radiotherapy procedures of such small fields using radiation oncology unit. In addition, the dosimetric measurements with the diodes and ionizing chamber indicated that the perturbations of doses at the central axis in the small fields increases due to the presence of heterogeneities within the non-homogeneous region and thereafter. Therefore, considering the perturbations happened between the boundaries of non-homogeneous area could increase the accuracy of the dosimetry procedures in such occasions.

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