AbstractID: 1494 Title: 4 MV versus 6 MV x-ray irradiation dosimetric effects in the presence of air cavities in the head and neck region

In the present work we study the effects of air cavities (the near-interface loss of electronic equilibrium) at energies of 4 MV and 6 MV, in search for the possible differences in the clinical effectiveness of treatments at these two energies in the head and neck region.

The on-axis and off-axis dose distributions are measured with a parallel-plate ionization chamber and films in polystyrene phantoms containing air cavities of appropriate size, which was determined on basis of computed tomography scans of 15 patients for both larynx and maxillary sinus.

For most clinically relevant situations the photon energies of both 4 MV and 6 MV yield similar results for the larynx and maxillary sinus phantom as long as the field sizes are equal to or larger than 4×4 cm^2. For extremely large cavity dimensions (comparable to or larger than the field size) the use of the 4 MV photon beams will give a smaller underdose effect.

For both energies a significant underdose effect is found at the edge of the field in the larynx phantom, which is essential for small and large fields, for smaller and larger channels, for one-beam as well as parallel-opposed beams. To avoid significant underdose effects here, additional margins (~ 1 cm) along the larynx should be used. The effects at the edge of the field for the maxillary sinus can be important only when the size of the air cavity is larger than the field size.