AbstractID: 1631 Title: Dose calculation of an image guided intensity modulated x-ray brachytherapy system for silver and molybdenum targets

An image-guided intensity-modulated x-ray brachytherapy system is being developed for tumor treatment. This novel device has advantage over conventional radioisotope brachytherapy. One of the advantages is that clinic staffs can control energy as well as dose rate for different tumor according to its size and location. This system mainly composed of x-ray tube includes primary target, guide tube and secondary (pseudo) target. Owing to its simple configuration, convenient modulations of fluorescent x-ray energy and intensity are possible outside of a patient body. Applicability of this novel system for various primary and secondary target combinations was tested with Monte Carlo calculation and experiment. In this study, dose distribution around the needle which containing secondary target for various combinations and target angles were calculated using MCNP5 Monte Carlo code. Among the various primary and pseudo target combinations, silver-molybdenum (Ag-Mo) was used for the calculation. Secondary x-ray dose mostly from K edge fluorescent (17.5 keV) of Mo was calculated for longitudinal and vertical plane of the needle that contains pseudo target. Radial dose fall-off of Ag-Mo was much significant than commercially available brachytherapy sources (^{103}Pd and ^{125}I) due to its low characteristic x-ray energy. Irradiated dose area around the source was decreased as increase of wedge angle of the pseudo target. As a conclusion, conformal treatment of small lesion area is possible by changing secondary target location and wedge angle as well as primary and secondary target variation.