AbstractID: 11171 Title: Study on Secondary Cancer Risk Induced by Intensity-Modulated Radiotherapy and Passive Proton Beam Therapy

Purpose: Secondary cancer risk induced by radiation therapies, intensity-modulated radiotherapy (IMRT) and passive proton beam therapy, was estimated and compared for prostate and head & neck patients. **Method and Materials:** The concept of an organ equivalent dose (OED) for radiation-induced cancer was applied to dose distributions of patients to estimate organ specific radiation-induced cancer risk. IMRT with 6 MV photons and proton beam therapy were planned for 5 prostate and 5 head & neck cancer patients. The treatment beams were delivered to humanoid phantom and secondary doses during irradiation were measured at various points from 20 cm to 60 cm apart from the beam isocenter on humanoid phantom using ion chamber and CR-39 detectors for IMRT and passive proton beam therapy, respectively. **Results:** The average secondary doses for prostate cancer patients in passive proton beam therapy, which is neutron dose equivalent to the proton absorbed dose (H(10)/D) measured from 20 to 60 cm from the isocenter, ranged from 0.4 mSv/Gy to 0.1 mSv/Gy. The average secondary doses in IMRT for prostate patients, ranged between 3 mSv/Gy and 1 mSv/Gy whose values are approximately order of magnitude higher than the proton therapy. Although the average secondary doses for head & neck cancer patients in proton therapy were less than the average secondary doses in IMRT, the difference was not significant as the prostate cases. **Conclusion:** By a comparison between passive proton beam therapy and IMRT for diseases of prostate and head & neck, it was shown that the estimated secondary cancer risk using scattering mode in proton beam therapy is either significantly lower than the cases in IMRT treatment or, at least, does not exceed the risk induced by conventional IMRT treatment.