AbstractID: 13658 Title: Towards range guided prostate treatment using an AP field

Purpose: Proton treatment of prostate by anterior fields offers potential benefit in rectal sparing. However such treatment requires an accurate control of the beam range. We have recently proposed a method for in-vivo range determination for prostate treatment by anterior fields, based on time-resolved dose rate measurement. The method has been successfully tested against range shifting and range mixing of protons due to tissue inhomogeneity using simple geometric configurations in a water tank. In this study, we further evaluate the effectiveness of the method using a human pelvic phantom.

Methods: A human pelvic phantom was used to mimic a real prostate treatment. The phantom was first CT scanned with a full bladder and a water balloon in the rectum. A treatment planning software was used to compute the water equivalent path length (WEPL) between the phantom surface and the anterior inner surface of the rectum cavity, along the direction of an anterior beam. The phantom prostate was then irradiated using an anterior proton beam. A pinpoint ionization chamber was used to measure the time-resolved dose rate function along the wall of the rectal cavity with spatial resolution of 0.25 mm. The obtained dose rate function were used to derive the corresponding WEPL values, and then compared with those calculated by the treatment planning system.

Results: The time-dependence of the measured dose rate functions showed limited deviations from those measured in a water tank, indicating a relatively low level of range mixing. This is consistent with the relatively mild tissue inhomogeneity along the beam path, despite the presence of the pubic bones. The discrepancy between the measured and calculated WEPL values is below 2mm.

Conclusions: The time resolved dose rate method can be used, with reasonable accuracy, to control the beam range in prostate patient if treated by anterior fields.