AbstractID: 13618 Title: CBCT reconstruction during VMAT delivery using Elekta Synergy system

**Purpose:** The advantage of in-treatment cone-beam computed tomography (CBCT) imaging is direct verification of time-averaged tumor position during treatment. Volumetric modulated arc therapy (VMAT) treatment using current linear accelerator with an on-board CBCT unit actually enables us to acquire in-treatment CBCT. For instance, Elekta Synergy system (Crawley, UK) is equipped with such CBCT function. During VMAT, however, it is not always allowed to obtain CBCT images, but kV projection imaging only can be performed in Synergy system. In this investigation, we tried to reconstruct in-treatment CBCT images based on kV projection imaging of Synergy system during VMAT delivery.

**Method and Materials:** VMAT plans (for cancer in prostate, head and neck) having non-regular rotation were created by Pinnacle$^3$ v9.0 SmartArc (Philips), and were delivered with simultaneous irradiation of kV on "Motion View" mode of Synergy system. Using the projection images with scattering correction of MV beams due to VMAT delivery, volumetric image was reconstructed. For the correction, intensity curve difference of adjacent lines in sinogram was considered. In addition, intensity profile of MV beam is also employed for the correction. Here, a modified-Hamming filter was employed as a reconstruction filter in filtered back projection algorithm. The geometric non-idealities in gantry rotation were also corrected in the present reconstruction.

**Results:** In-treatment volumetric reconstruction images of a phantom were acquired successfully by the present method. The scattering of MV treatment beams on kV projection images during VMAT delivery does not affect significantly to the contrast of reconstruction images. The delivery of VMAT was not disturbed by the simultaneous delivery of kV cone beam.

**Conclusion:** This preliminary study indicates that in-treatment CBCT reconstruction images can be acquired by using "Motion View" mode of Synergy system.