Purpose: A Volumetric Modulated Arc Therapy (VMAT) provides a reconstruction images from MV portal imaging, named as “VMAT-CT”. The purpose of this presentation is to improve the image quality of four-dimensional (4D) VMAT CT by considering beam intensity and field-size (output) factor.

Methods: Sequential MV-portal images during VMAT delivery were acquired using the iView software (Elekta). The gantry angle information was obtained by connecting the multi-leaf collimator (MLC) shape derived from a portal image with that described in treatment log data via Elekta software protocol, iCom. After background correction and masking with a specific threshold value, a beam-intensity correction was performed using the log data. Further, we introduced output-factor correction in order to correct the intensity depending on the size of field of view (FOV). A respiratory signal was derived from simultaneous kV-portal imaging orthogonal to MV imaging by using image-based phase recognition technique. Synchronizing with kV ones, then, MV-portal images were classified to corresponding breathing-phase bins. Consequently, both 4D VMAT-CT and 4D kV cone-beam CT (CBCT) were reconstructed independently with conventional filtered-back projection algorithm.

Results: The beam-intensity and field-size corrections were reasonably applied in the 4D VMAT-CT reconstruction. It was observed that the image quality of 4D VMAT-CT was improved both in phantom study and clinical cases.

Conclusions: The image quality of 4D VMAT-CT was improved by considering the beam intensity and output factor. It is expected that the VMAT-CT superimposed into the planning CT, pre-, or in-treatment kV CBCT provides a guarantee of irradiated region in actual treatment.