Dosimetric Comparison of VitalBeam® and Halcyon™ 2.0 for Hypofractionated Volumetric Modulated Arc Therapy (VMAT) with Simultaneous-Integrated Boost (SIB) treatment in Early Stage Left-Sided Breast Cancer

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Purpose

- Difference of MLC configuration
  - MLC Design, Dosimetric leaf gap (DLG), MLC Speed, Gantry speed
- Plan quality
  - Reducing probability of heart toxicity and radiation pneumonitis caused by Dosimetric difference
- Delivery time
  - Minimizing intrafraction motion error and improving clinical efficiency caused by Delivery time

To compare the plan quality between Halcyon™ with the dual-layer MLC and VitalBeam® with the Millennium-120 MLC in terms of target coverage and OARs sparing in early-stage left-sided breast cancer treated with hypo-fractionated simultaneous integrated boost (SIB)-VMAT techniques.

Materials and Methods

- Schematic diagram of this study
- Acquisition of DVH data (Pilum early-stage left-sided breast cancer)
- Establish the plans of DL-MLC and VB-MLC
- Step1. Plan quality evaluation between DL-MLC and VB-MLC plans
- Step2. The comparison of delivery time between DL-MLC and VB-MLC plans

Results

Dose-Volume Histogram between DL-MLC and VB-MLC

Conclusions

- The differences of MLC configuration between dual-layer MLC (DL-MLC) and Millennium-120 MLC (VB-MLC) are possible to induce OAR sparing with higher delivery efficiency.
  - The mean dose of the heart and whole lung in the DL-MLC plan was significantly reduced by 14.6% and 5.7% compared with VB-MLC
    (Dmean of the heart: 549.02±61.894 cGy, 642.65±56.445 cGy, Dmean of the ipsilateral lung: 949.08±74.144 cGy, 1004.41±74.652 cGy, Dmean of the whole lung: 621.37±42.687 cGy, 659.68±39.908 cGy)
  - The average delivery time of DL-MLC was reduced by 21.8% compared with VB-MLC plan (Delivery time: 79±10 sec, 101±11 sec)