Purpose: To evaluate dosimetric differences of IMRT lung plans generated from RayStation Multi-Criteria Optimization (MCO) and Pinnacle Direct Machine Parameters Optimization (DMPO)

Methods: Five patients previously treated with plans from Pinnacle v9.0 using DMPO algorithm were re-planned on RayStation v2.4.8.180 using MCO Pareto plans with same dose constraints, beam angles and objectives. The prescription was 60 Gy to 95% of PTV. Planning outcomes such as D95 (95% of volume receiving the prescribed dose), D2, D1 for PTV, D33 and mean dose for heart, V20 (volume receives at least 20 Gy) and mean dose for lung, max dose for cord were reported for evaluation according to our clinical protocols. The conformity of the prescription isodose volume to PTV was evaluated as conformity index (CI). Planning time was also observed.

Results: The mean volume of PTV was 356 ± 141 cm³. The D95 of PTV with RayStation was improved and more uniform compared to plans from Pinnacle (59.4 ± 0.2 vs. 59.2 ± 0.8 Gy), respectively. D2 and D1 of PTV were lower with RayStation plans. Mean dose and V20 of total lung were lower for all RayStation plans with max dose of cord, and D33 and mean dose of heart following the same trend. CI was better with RayStation compared to Pinnacle (1.09 ± 0.06 vs. 1.16 ± 0.11). Planning time was faster with RayStation from Pinnacle (few minutes vs. minimum of 20 minutes, approximately).

Conclusions: MCO planning automatically generates a set of Pareto optimized solutions for given objectives to allow tradeoffs between targets and critical organs. RayStation can achieve better uniform tumor coverage with fewer hot spots while sparing more critical structures. MCO Pareto based IMRT plans is helpful in determining the best optimized dosimetry with shorter planning time.