

AbstractID: 11773 Title: The impact of variable gantry rotation speed and dose-rate on the quality of aperture-modulated arc therapy (AMAT)

**Purpose:** From its early inception, DMLC-based IMRT has differed from Binary MLC-based helical IMRT by delivering the treatment volumetrically. As the field of IMRT evolved, the demands on its performance converge to three main criteria: quality of dose plans, speed of treatment delivery, and amount of leakage exposure. Many have ventured the approach of DMLC-based aperture-modulated arc (AMAT) therapies, indicating their potential to satisfy these three criteria. The traditional arc therapy is delivered with a constant gantry rotation speed and a constant dose rate. It is logical to expect that if the outputs at any transient gantry position can vary, the capacity or flexibility of dose optimization would increase, regardless of the type of aperture modulation algorithms. The technology of arc delivery with varying gantry rotating speed and dose-rate has recently become available. We conducted a study to investigate the impact of these new arcing parameters. **Method and Materials:** The study is conducted on the following equipments: a Varian Trilogy linear accelerator, the Varian Eclipse planning system and the Pinnacle SmartArc module. The linac can operate in constant dose-rate/gantry rotation mode or varying dose-rate/gantry rotation mode. Plans were derived with constant dose-rate/gantry rotation and varying dose-rate/gantry rotation. The comparisons were carried out as objectively as possible based on the three criteria with set benchmarks. **Results:** From a limited range of examples studied, it is observed that while AMAT with constant dose rate and gantry rotation is capable of producing good dose plans, dose-rate and gantry rotation variation allows further improvement of the dose plan and the delivery efficiency. MLC inter-digitation also increases the flexibility of planning and the delivery efficiency. **Conclusion:** The quality of plan and the treatment delivery efficiency are inter-related. While plan evaluation is often subjective, a greater technical flexibility undoubtedly increases planning capacity and improves delivery efficiency.