

**Purpose:** The maximum dose rate at the regular filter mode of a Varian Linac is 600 MU/min. In comparison, the dose rate for flatter filter free (FFF) mode of Varian TrueBeam linac is up to 1400 MU/min at 6MV. The purpose of this study is to investigate the clinical use of IMRT treatment in FFF mode at high dose rate.

**Method:** Ten prostate patients' plans were generated using regular and FFF mode at 6 MV using Eclipse treatment planning system. PTV varies from 122-233 cc. Four types of plans were generated for each patient: multifield IMRT using regular filter mode, multifield IMRT using FFF mode, RapidArc(RA) using filter mode, RA using FFF mode. To facilitate comparison, same constraint table was used for each patient to optimize the fluence. Continuous high definition MLC sequences were generated at maximum dose rate of each mode.

**Results:** With same optimization parameters, the plan quality is comparable for each plan. The maximum doses to target and organs are slightly higher for FFF mode with the same IMRT technique. Total MU for FFF mode and multifield IMRT technique is much higher than their counterparts. Nonetheless the beam-on time is substantially lower for FFF mode due to higher dose rate.

**Conclusion:** IMRT plans for the two filter modes are comparable. Although the dose rate for FFF mode is much higher than filter mode, FFF mode requires much more MUs to deliver the same amount of dose. Many MUs are used to move MLC leaves to compensate sloping region of beam profile in FFF mode. This reduces MU efficiency when irradiating large targets with irregular shapes. High dose rate treatment in FFF mode is more efficient to SRS treatment for small target. RapidArc technique may help reduce the delivery time for treatment of large target.