Purpose:

To investigate the dosimetric effects of delivering a VMAT plan optimized for a straight-beam linac on a bent-beam linac.

Methods:

When a linac is unavailable to treat, it is common practice to transfer patients to another machine that has been dosimetrically matched. The purpose of this study was to evaluate the changes in the dose to organs at risk (OAR) and planned target volumes (PTV) due to a patient transfer from Clinac 600C/D to Clinac 23EX. The former is a straight beam machine (no bending magnet) and the latter has an achromatic bending magnet. Both machines are equipped with 120 Millennium MLCs.

Nine VMAT plans (three treatment sites) originally optimized for the Clinac 600C/D were recalculated for the Clinac 23EX. Each plan was recomputed with the Pinnacle3 treatment planning system to deliver the same dose to the same treatment volume using the same number of monitor units for the entire treatment regime. To quantify the variations, the dose volume histograms (DVHs) for each plan, V50, mean and maximum dose to the OARs and PTV were compared.

Results:

The V50 of the OARs in the recalculated plan for the Clinac 23EX increased by an average of 15.2% (STD=15.1%). The increases on the maximum and mean dose to the OARs were on average 2.9±1.4% and 5.9±2.7% respectively. The maximum and mean PTV doses also increased for all of the 9 patients by 2.3±1.2% and 2.5±1.0%.

Conclusions:

The results indicated that the delivery of a VMAT plan for Clinac 600C/D on Clinac 23EX will increase the dose to the PTVs and OARs. In cases where a patient is transferred to another machine for a single or small number of fractions, changes in dose distribution may be clinically insignificant; otherwise dosimetric evaluation of the transferred treatment to on another machine is highly recommended.