Purpose: The purpose of this work is two fold 1) *to validate the ability of the two Tomotherapy Hi ART II machines to produce consistent dose distributions 2) Validate the use and ability of sinogram-based quality assurance (QA) for Tomotherapy IMRT delivery on two machines*

Materials and Methods: Two helical Tomotherapy machines were twinned in our clinic to have nearly identical beam characteristics. However, there is no provision for determining the consistency of delivery for a patient plan transferred from one machine to the other. One way to do this is to perform point dose and planar dose measurements for each plan on both machines, but this takes a lot of time. Another is to compare the patterns of MLC leaf-open times (sinograms) on the two machines. In this work we have studied the dosimetric characteristics of our two Tomotherapy machines, namely the treatment beams and their ability to deliver consistent dose distributions for 50 patients. We also compared the planned sinogram to the recalculated sinogram after transferring the patient plan to the other machine, and plotted the sinogram differences between the two machines.

Results: The planned sinogram and delivery sinogram for both machines were found to be sufficiently similar (after taking into account the small differences between the two machines). The sinogram-based QA was validated using point and planar dose measurements.

Conclusions: From the results it can be concluded that in spite of the complex delivery system, Tomotherapy machines can be matched to have similar beam characteristics and can yield nearly identical intensity-modulated dose distributions. Also, it is not necessary to perform patient-specific QA on both machines to ensure dose delivery similarity. Sinogram-based QA provides an efficient QA for twinned Tomotherapy delivery.