Abstract ID: 14840 Title: Comparison of SBRT treatment plans using conventional linear accelerator based non-coplanar beam arrangements versus Tomotherapy.

Introduction The growth of stereotactic body radiation therapy (SBRT) as a treatment modality for patients with lung cancer is evidenced by the proliferation of related clinical protocols. The key principles for an effective SBRT plans is high dose conformality to the planning target volume (PTV) and large dose gradients outside of the PTV. This is traditionally achieved through a large number of non-coplanar beams. In this study SBRT treatment plans generated using the helical treatment delivery capabilities of Tomotherapy are compared to that of a conventional linear accelerator (linac) based non-coplanar approach. Although Tomotherapy is not capable of producing non-coplanar beams, it has the potential advantage of optimizing and delivering hundreds of individual beamlets, i.e. an intensity modulated radiation therapy (IMRT) approach to SBRT. In this work, we compared treatment plans for each of these two treatment modalities, in order to assess their relative ability to deliver conformal SBRT. **Method and Materials** Treatment plans generated with the CMS XIO planning system for six patients treated with 7- 10 conventional non-coplanar beams were recalculated for delivery on a Tomotherapy linac. The prescription was set to 95% of the PTV shall receive 48Gy in 4 fractions. The GTV minimum was set to 52Gy and maximum 60Gy. The plans were then compared using the conformality and dosimetric structure limits as specified in the RTOG0915 protocol for the 48Gy arm as a metric. **Results** For each of the twelve plans, the maximum dose fell within the gross tumor volume (GTV) and was within the allowable range specified by the RTOG0915 protocol. The Tomotherapy SBRT plans had a systematically lower maximum dose (53.3Gy to 56.6 Gy) than the Linac SBRT plans (57.3Gy to 62.3Gy). Most organs maintained equivalent doses for the two different planning systems. The dose delivered to the lung was found to be higher for Tomotherapy SBRT. Although this increase is small for the V20 (increasing by about 1% for all patients), the V5 increased by ~50% (from 20% - 30%). All 6 linac SBRT plans had deviations from the protocol for the maximum dose 2cm away from the PTV (5 minor 1 major), while none of the Tomotherapy plans had deviations. The Tomotherapy SBRT plans consistently delivered more integral dose by as much as 30% than the conventional linac SBRT plans. **Conclusion:** By driving our study with conformality as the goal we were able to see that Tomotherapy SBRT has the capability of conforming the high isodose lines tightly around the PTV. It is therefore feasible to treat SBRT patients using Tomotherapy. More conformal plans and sharper dose gradients can be achieved with Tomotherapy when the prescription isodose line is closer to 80% instead of 90%, i.e. the hotspot in the GTVis allowed to increase.

Educational objectives:

1. Understand the differences between helical tomotherapy and conventional non-coplanar SBRT delivery.
2. Understand the advantages and disadvantages of using tomotherapy for SBRT