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Purpose: To perform a dosimetric comparison between Linac and Helical Tomotherapy-based IMRT on head and neck (H&N) patients treated similarly and to evaluate any potential clinical consequences of dosimetric differences.

Method and Materials: This is a retrospective study of 23 H&N cancer patients treated on HT. All patients were planned both on the HT and the Pinnacle planning system. The prescribed dose was 66 Gy at 2.2 Gy per fraction to the PTV. The dosimetric parameters used for comparison were: R^{95} = the ratio of the average dose to 95% of the PTV to the prescribed dose; R^c = the ratio of the PTV coverage to PTV volume, where the former was defined as the volume enclosed by the 66 Gy isodose surface; Biologically equivalent doses (BED) to organs at risk (OAR) and PTV dose homogeneity were also studied. The tolerance range or TR (standard deviation/PTV average dose) was used as a surrogate for PTV dose homogeneity evaluation.

Results: R^{95} results indicated that both IMRT techniques produced comparable conformal plans. R^c values showed that HT plans generally provided better tumor coverage. TR results suggest that PTV dose homogeneity was better for HT plans. Finally, the average OAR BEDs showed a trend of better normal tissue sparing with the HT plans. The exception was for the spinal cord, in which the maximum BED using HT was slightly lower than the maximum BED using linac-IMRT.

Conclusion: This study suggests that HT plans had in general better dosimetric characteristics, especially regarding tumor coverage, PTV dose homogeneity and normal tissue sparing in physician approved plans. Dose reductions to OAR may not yield any clinical differences in outcome in virtue of the delivered OAR doses which are well below normal tissue tolerance.