AbstractID: 9323 Title: Validation of Treatment Planning and Delivery in Conventional Linear Accelerator Without Flattening Filter

Purpose:
The purpose of this study was to compare planning and delivery accuracy of IMRT on a conventional linac with and without the flattening filter.

Method and Materials:
The 6 MV x-ray beam of a Siemens Oncor linac was modified by removing the flattening filter, enabling dose rates of 1000 MU/min, and modeled within a commercial treatment planning system. IMRT treatment plans created with the flattening filter (F) were re-optimized with equivalent segments and computed for the beam model without the filter (NF) on 10 clinical head-and-neck cases. All plans (F and NF) were compared for equivalence and delivered to phantoms; treatment time and dose agreement with planning system were determined.

Results:
Dose distributions are similar between the two beam lines, and clinically reasonable plans were created despite the absence of the flattening filter. PTV hot spots were <0.5% hotter and cold spots were <0.5% colder for the (NF) plan. Similarly, all other ROIs investigated were within 1% for hot spots and cold spots. On average NF plans required 15% more MU, but delivered treatments were shorter (9 min vs 11 min). Dosimetric differences between computed and ion chamber measurements were similar (-1.7%+/-1.3% - F) and (1.7%+/-1.9% - NF). The number of pixels meeting gamma map criteria of 3%/3mm, 5%/5mm, and 7%/7mm were statistically equivalent ($p = 0.6$): [88.5%, 96.8%, and 97.8% (NF)], [87.8%, 96.6%, and 97.9% (F)].

Conclusion:
The planning system was able to generate equivalent plans, and measured dose distributions in ion chamber and film show no difference between beam models with or without the flattening filter. At the higher dose rate, overall treatment times were reduced and could be applied to gating and hypofractionation.

Conflict of Interest (only if applicable):
Research supported by industrial grant from Siemens Medical Solutions.