

AbstractID: 7006 Title: Is Monte Carlo Calculation Necessary for Prostate Patients with Hip Prostheses?

Purpose:

To determine whether Monte Carlo calculation should be used for all IMRT patients with metal implants by comparing the dose distributions from two commercial dose calculation engines for patients with hip prostheses undergoing concurrent treatment of prostate and pelvic lymph nodes.

Method and Materials:

IMRT treatment plans from four patients with hip prostheses, including two patients with bilateral prostheses, were optimized using the Corvus planning system, which calculates dose using a finite size pencil-beam algorithm with an equivalent path-length correction to account for tissue heterogeneities. The plans were subsequently calculated with Monte Carlo (Peregrine) for another final dose calculation. All plans were normalized and assessed based on changes in dose coverage.

Results:

For patients with bilateral prostheses, the dose to 95% (D95) decreased 8.7% for the prostate when calculated with Peregrine, with a corresponding decrease of 9.5% for the lymph nodes. For patients with a unilateral prosthesis, the D95 decreased 8.2% for the prostate, and 7.9% for the lymph nodes. The percentage decreases in the D5 and D20 for the bladder were 8.2% and 9.0%, and 7.3% and 8.2% for the rectum, respectively, for patients with bilateral prostheses. For patients with a unilateral prosthesis, the D5 and D20 were 13.9% and 11.0% lower for the bladder and 7.8% and 8.8% lower for the rectum, respectively.

Conclusion:

This study shows that IMRT plans for patients with extensive tissue heterogeneities can produce very different dose distributions, depending on the dose calculation engine used. Future studies will investigate whether the discrepancies are due to the dose calculation algorithms, or to the tissue heterogeneity correction methods. In addition, a third dose calculation engine (Pinnacle), which uses a superposition-convolution algorithm, will be included, and phantom measurement studies will be conducted.

Conflict of Interest (only if applicable):

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