

AbstractID: 9215 Title: Improving rectal sparing with a single anterior proton beam: a planning study

Purpose: To demonstrate the potential dosimetric advantage of an anterior proton beam for treatment of prostate cancer patients utilizing the Bragg peak for rectal sparing. Methods to detect the anterior proton beam at depth are being investigated to eliminate the large distal planning margin, enabling abrupt dose falloff at the anterior rectal wall rather than the relatively shallow falloff of the lateral beam penumbra with conventional lateral beam arrangement.

Method and Materials: 27 consecutive prostate cancer patients treated with proton therapy were enrolled in a planning study to compare standard IMRT and bi-lateral proton treatments with a single anterior proton beam treatment. Dose-population histograms were generated comparing target coverage and normal tissue sparing of all critical structures between the treatment groups.

Results: The anterior beam treatment significantly spared the anterior rectal wall more than the IMRT and bilateral beam treatments at the 70 Gy (12.3% vs 19.2% and 19.2%), 60 Gy (15.7% vs 23.8% and 24.3%), 45 Gy (19.4% vs 30.1% and 29.6%), and 30 Gy dose levels (22.7% vs 39.9% and 34.2%). Bladder wall dose was greater in the anterior beam treatment than IMRT and bilateral beam treatments at the 70 Gy (14.1% vs 11.2% and 12.8%), 60 Gy (22.5% vs 13.7% and 16.2%), 45 Gy (29.0% vs 17.9% and 19.8%), and 30 Gy dose levels (32.6% vs 25.1% and 23.1%). No dose was delivered to the femoral heads with the anterior beam treatment while the IMRT and bilateral treatments delivered a mean dose of 17.0 Gy and 25.1 Gy to the femoral heads respectively.

Conclusion: With the implementation of in vivo proton beam detection, anterior proton beam treatment of prostate is a possible treatment alternative, sparing dose to the rectum and femoral heads at the cost of a small increase in bladder dose.