Dose Painting for Prostate Cancer using IMRT techniques

Dose painting, the ability to identify specific areas of gross disease and normal tissue within a target and sculpt the dose distribution to deliver desired dose to these areas, is becoming possible by incorporating biological imaging into IMRT planning. The purpose of this study was to evaluate the efficacy of IMRT planning to deliver these types of treatments for prostate cancer. Plans using 30 equispaced coplanar fields were designed to treat a small GTV within the PTV (prostate and seminal vesicles plus margin). The goal was to deliver 99 Gy to the GTV and 91 Gy to the PTV, except where the PTV and critical structures overlap. Doses to normal structures were constrained such that the urethral dose was limited to 86 Gy and no more than 30% of the rectal wall received more than 75.6 Gy.

Treatment plans were generated for 5 patients. The average volume of the PTV excluding critical structures which received at least 86.5 Gy (95% of 91 Gy) was 89±3%. Minimum and average GTV doses were 94±5 Gy and 104±1 Gy, respectively. Maximum urethral dose was 85.6±0.7 Gy and the rectal wall volume receiving more than 75.6 Gy was 21±7%. The effects of GTV position and number of fields on the dose distributions will also be discussed. This study indicates the feasibility of dose painting and IMRT to dose escalate to unprecedented levels while respecting the predetermined normal tissue constraints.