Purpose: To investigate the effects of an endorectal device during prostate radiotherapy on the spatial distribution of dose to the ano-rectal region and quantify implications for normal-tissue-complication probabilities.

Methods: Twenty-three patients with localised prostate cancer, referred for external beam radiotherapy had 2 CT scans acquired, without and with the rectal obturator (ProSpare) in-situ. For each patient two dose distributions were generated, based on both CT scans. Dose-surface maps for the rectal surface and the anal surface were generated and mean dose as well as a spatial measure (circumference of the dose distribution) were determined for all patients, with and without ProSpare. Using previously published NTCP models, the effect of ProSpare on NTCP was investigated for rectal bleeding and subjective sphincter control.

Results: In a previous study subjective sphincter control correlated strongest with mean dose and lateral extent at 53 Gy. The use of ProSpare resulted in a highly significant reduction of the lateral extent at 53 Gy (p=0.006), mean dose (p=0.0009) and NTCP according to the LKB model (p=0.002 for grade 2 and p=0.001 for grade >=1).

In a previous study we reported that rectal bleeding correlated most strongly with the lateral extent at 55 Gy and presented the constraint that it should not exceed 42% of the circumference. Using ProSpare resulted in a significant reduction of the lateral extent at 55 Gy (p=0.001) and significantly more patients met that proposed constraint (p=0.047). ProSpare resulted in a significant reduction of NTCP for grade-2 rectal bleeding (p=0.007) and a reduction for rectal bleeding grade >=1 (p=0.053).

Conclusions: ProSpare resulted in a significant reduction of mean dose to the anal sphincter and a significant reduction of the lateral extent at 55 Gy. This corresponded to a significant reduction in the predicted risk of reporting subjective sphincter control and grade-2 rectal bleeding.