provision center for PROTON THERAPY

Clinical and Dosimetric Aspects of Prostate Cancer Patients Treated with Pencil Beam Scanning (PBS) Proton Therapy Utilizing Hydrogel Rectal Spacer

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Purpose

Hydrogel SpaceOAR (Gel) has been utilized in the treatment of prostate cancer with both proton and photon therapy since it's FDA approval in 2015. The purpose of this study is to report the effect of a hydrogel spacer on the reduction in rectal dose in patients treated with image guided pencil beam scanning (PBS) proton therapy, when compared to endorectal balloon (ERB).

Methods

- 138 patients underwent proton therapy for localized prostate cancer (42 ERB and 96 Gel).
- Gel placements were performed as an outpatient transperineal procedure under local numbing.
- Eighty-seven patients received 78Gy$_{(RBE)}$/39 fractions (Standard fractionation): 62 had Gel, 25 had ERB.
- Fifty-one patients received 62Gy$_{(RBE)}$/20 fractions (Hypofractionation): 34 had Gel, 17 had ERB.
- Dosimetric indices were compared between ERB and Gel for Standard and Hypo patients using Wilcoxon signed rank test

Results

- In 78Gy$_{(RBE)}$ patients, ERB mean rectal V74, V70.2 and V65 Gy$_{(RBE)}$ were 4.0, 5.8 and 8.4% compared to Gel 0.5, 1.0 and 1.9% ($p<0.001$). Figure 2
- Similarly, in 62Gy$_{(RBE)}$ patients, ERB mean rectal V59, V55.8 and V52 Gy$_{(RBE)}$ were 4.3, 6.3 and 8.2%, while the corresponding values with Gel were significantly lower at 0.2, 0.7 and 1.5% ($p < 0.001$). Figure 2
- Target coverage and V90% bladder sparing were not different between ERB and Gel for either fractionation. Figure 1
- All Gel placements were performed successfully

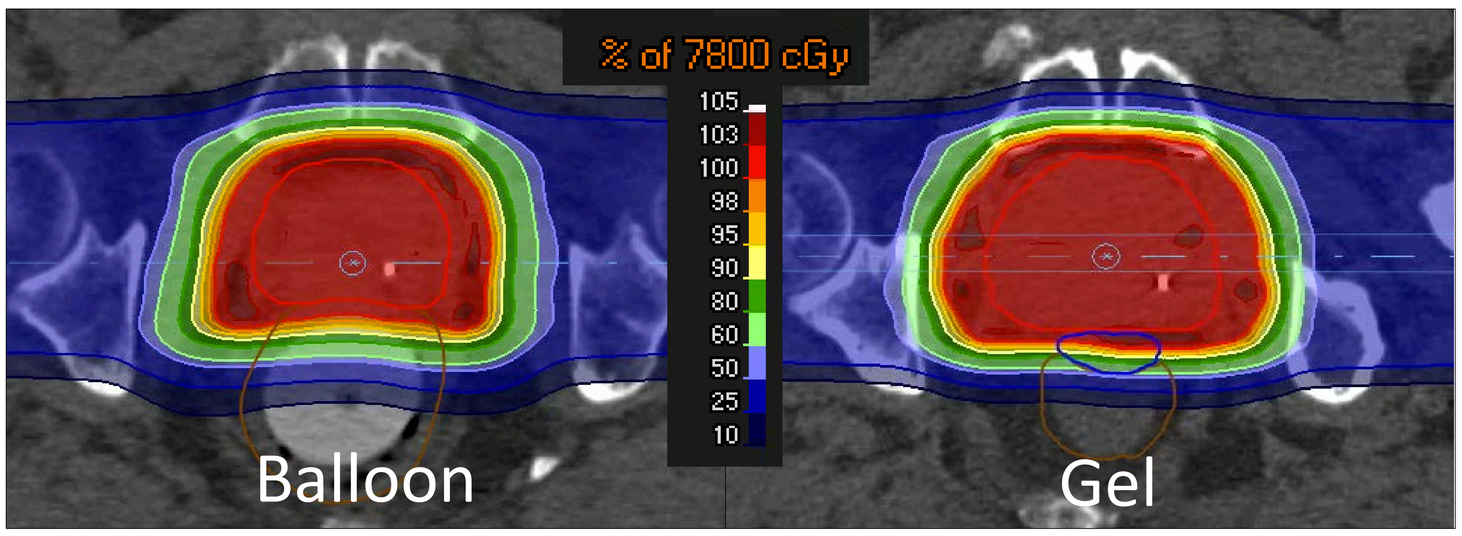

Figure 1. Isodose comparison of an ERB (left) and Gel (right) plan. Prostate is contoured in red, rectum in brown, and Gel in blue.

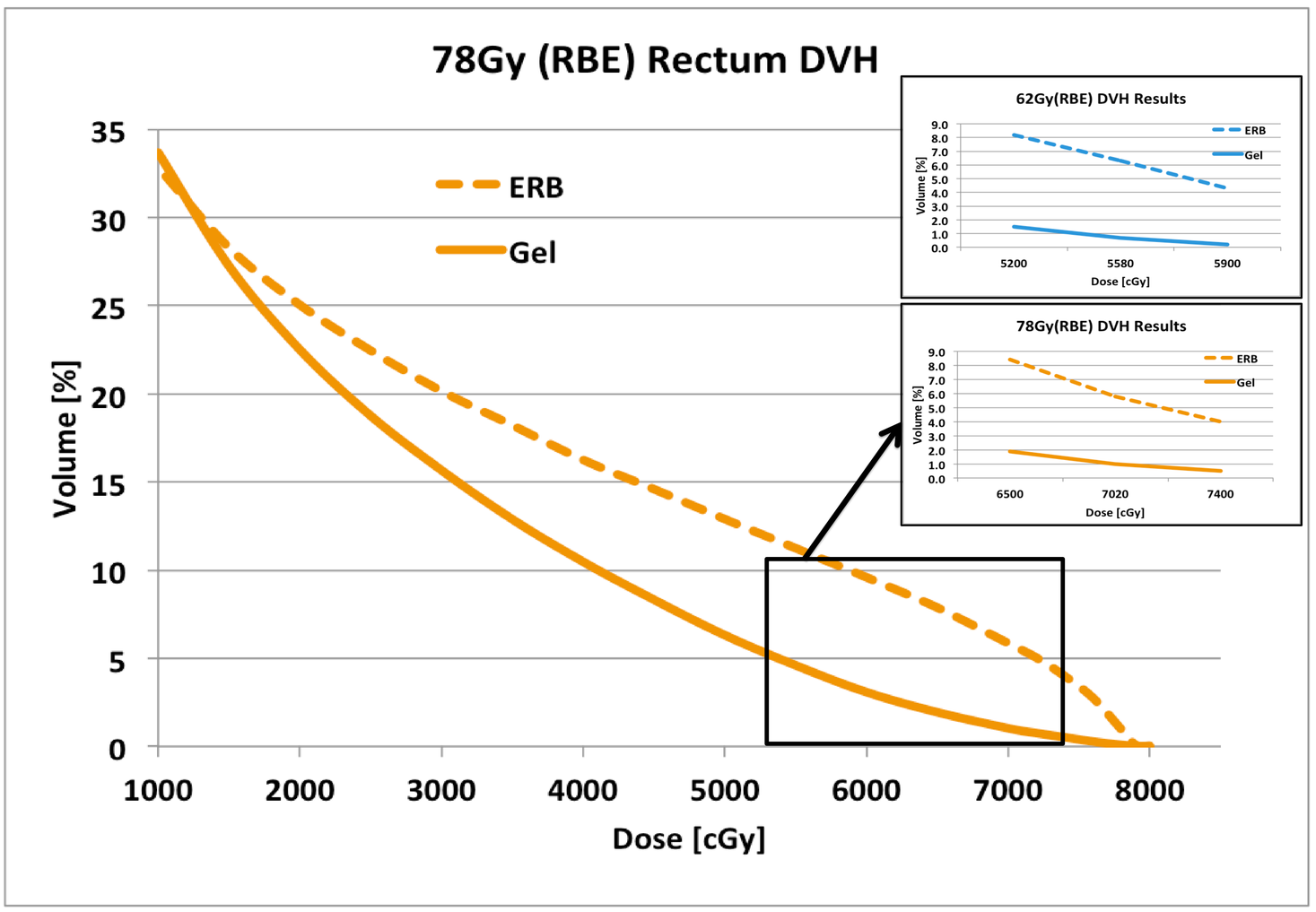

Figure 2. Rectum DVH comparison of ERB (dashed) and Gel (solid). Inset images are zoomed DVH data for the 62Gy (top) patients and 78Gy (bottom) patients

Conclusions

Hydrogel SpaceOAR significantly decreased rectal dose in patients treated with PBS proton therapy when compared to ERB. The rectal dose sparing benefit provided by Gel remained highly significant, especially in the higher dose range for standard and hypofractionated regimens.

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