First Report for a New Pd-103 Line Source for Prostate Brachytherapy

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Background and Objective

LDR brachytherapy typically relies on loose or stranded isotope whose dosimetry is characterized as point sources. A polymer encapsulated ¹⁰³Pd source with a unique linear radioactive distribution may provide a useful refinement on prostate brachytherapy. A feasibility study was performed in a small cohort to assess the pre and post implant dosimetry trends, the ease and efficiency of use, and the patient side effects.

Methods

With IRB approval, volunteers with early prostate cancer were implanted at one of 2 centers. Implants were preplanned using the CivaString ¹⁰³Pd and VariSeed or Brachy-Vision treatment planning software. Implantation was performed using needles pre- loaded with CivaStrings as ordered at one of two centers: Arizona or New York. The planned prescription dose was 125Gy for monotherapy and 100Gy when given as a boost. Post implant dosimetry was performed based on CT images obtained at 3-6 weeks and are reported in percentages to account for differences between boost and monotherapy prescription doses. The number of needles required for adequate coverage was a primary endpoint. With secondary endpoints including full dosimetry parameters, active length of source, and reported ease of use.

Results

Planning was consistent between centers with mean D90% and V150%, 124% and 66% (AZ) and 126% and 78% (NY). One month post implant dosimetry was available for 18 patients.

Table 2: Planning and Post-operative dosimetric parameter values for patient prescribed 125 Gy monotherapy and 100 Gy combined therapy.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre-Op</th>
<th>Post-Op</th>
<th>Parameter</th>
<th>Pre-Op</th>
<th>Post-Op</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate Size (cc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>V150% (%)</td>
<td>69.0%</td>
<td>59.1%</td>
<td>V150% (%)</td>
<td>78.2%</td>
<td>73.5%</td>
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<td>V100% (%)</td>
<td>98.4%</td>
<td>88.6%</td>
<td>V100% (%)</td>
<td>98.1%</td>
<td>91.9%</td>
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<td>D100% (%)</td>
<td>68.8%</td>
<td>51.5%</td>
<td>D100% (%)</td>
<td>62.5%</td>
<td>44.5%</td>
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<td>D90% (%)</td>
<td>125.1%</td>
<td>101.7%</td>
<td>D90% (%)</td>
<td>127.5%</td>
<td>108.1%</td>
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</table>

Figure 7: Comparison of the location of the sources on day of implant (left column) to 30 days post implant (right column). Sources appear as white spots in the prostate gland. Note the location of the sources with respect to the bone anatomy does not change between the day of implant and 30 days post.

Conclusions

An initial experience with this new line source is presented. Excellent implants across a range of gland sizes were accomplished. Prostate volume changes were minimal suggesting minimal swelling using the linear sources. Good dosimetry is achieved for both preplans and eventual implants. Using a line source, the number of needles required per patient is less than that reported with standard brachytherapy sources¹. Intraoperative ease of use is good. The pre and post implant IPSS difference for these patients is in line with scores for patients treated with other LDR sources. With a line source, fewer needles are required but follow up is ongoing for this study to characterize clinical benefits.

Acknowledgements

This feasibility study is sponsored and funded by CivaTech Oncology.

References