CivaSheet pre-planning, activity calculation and application on a curved surface

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CivaSheet

Pd CivaSheet Design and Properties
- Flexible (membrane-like)
- Bio-degradable
- Low-energy
- Unidirectional (Au shield)
- Easy customization in the OR by cutting off sources from either 6 x 12 (5 x 10cm), or 6 x 18 (5 x 15cm) sheets
- Rudimentary pre-planning (depth, flat-sheet)
- Potential for mistreatment
- Dose is reconstructed post-treatment
- Intuition for decision-making in the operating room

Images source: CivaTechOncology.com
Monte-Carlo (FLUKA) Calculated Dose

Cylindrically-Symmetric Dose Kernel

Application of CivaSheet on a Flat Surface
The planes of Interest

Prescription plane (5mm depth, hot side)

Normal tissue plane (2mm depth, cold side)

Activity calculation

Sample Rx:
60Gy @ 0.5cm

From the graph:
60Gy/44[(Gy/dot)/4] = 1.36 U/dot

Implanted CivaSheets
Local Radius of Curvature

Application on a curved surface (R=3cm)

Dose Distributions at 5mm Depth on the Hot Side
Dose Distributions at 2mm Depth on the Cold Side

Dosimetric impact of tumor surface curvature

<table>
<thead>
<tr>
<th>Radius of curvature R (cm)</th>
<th>Mean normalized dose for 6x12 CivaSheet implant</th>
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<tbody>
<tr>
<td></td>
<td>Inward-facing implant (concave tumor surface)</td>
</tr>
<tr>
<td></td>
<td>cold side</td>
</tr>
<tr>
<td>1.5</td>
<td>0.48(8)</td>
</tr>
<tr>
<td>2</td>
<td>0.41(6)</td>
</tr>
<tr>
<td>3</td>
<td>0.34(4)</td>
</tr>
<tr>
<td>4</td>
<td>0.30(4)</td>
</tr>
<tr>
<td>5</td>
<td>0.28(3)</td>
</tr>
<tr>
<td>Planar</td>
<td>0.17(2)</td>
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