High Dose Rate Freiburg Flap Applicator for Skin Lesion Treatment
- *Alternative to Electron or Photon?*

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MedStar Health RadAmerica
Mercy Medical Center Radiation Oncology
Nucletron surface applicator

Freiburg Flap

Varian surface applicator

Valencia/Leipzig
HDR Freiburg Flap Applicator
Dose Fractionation and Planning

- **Skin cancer**
  - 4 Gy x 10 = 40 Gy
  - Prescribed to 1 cm depth
  - Every other day
- **Skin keloid**
  - 4 Gy x 3 = 12 Gy daily
  - Prescribed to 0.5 cm
- **Target**
  - V90 > 90% or V95 > 95%
Flap Commissioning

- Dose calibration - TLD
- Dose distribution – film and MapCheck
- Source dwell position – film/Source Pos Simulator
- First source dwell position – film/position simulator
- CT based Tx planning
  - Catheter reconstruction
  - Source activation
  - Optimization – IPSA – Graphical/Manual - points
- Secondary dose check with a spreadsheet
- Plan delivery
Freiburg Flap Commission
TLD and Film

* TLD for dose calibration within 2%

* Film to check source dwell positions within 1mm

* Film also to check the exposed pattern – dose distribution
Dose distribution for 12x12cm Flap prescribed to 1.5 cm depth
12x12 cm Flap with MapCheck
Head Lesion with Freiburg Flap
Squamous cell carcinoma treated at 1 cm with 4Gy x 10 every other day.
Treatment planning without mask
HDR versus Electron Beam
HDR vs Electron Plan

HDR
- Good dose conformality
- Hotter skin dose ~ 145%

Electron
- Hot area beyond PTV
- Less skin dose ~ 100%

Electron 6 MeV
Flap attached to the mask
HDR Flap- Skin Keloid: bilateral breast
6MeV Electron: bilateral breast
Photon 6MV using Two Arcs
Scatter Impact - Dose measurement using Ionization Chamber
Freiburg Flap of 7 x 7 cm w/ 1 cm bead
Flap with 1D Array Source

Scatter Impact: 1D Array of Freiburg Flap

- Relative difference (%) vs. 1D array size (cm)
- Data points at 0, 3, 7, and 12 cm
Flap with 2D Array Source

Scatter Impact: 2D Array of Freiburg Flap

<table>
<thead>
<tr>
<th>2D array size (cm²)</th>
<th>Relative difference (%)</th>
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</thead>
<tbody>
<tr>
<td>3x3 cm</td>
<td>4.0</td>
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<tr>
<td>5x5 cm</td>
<td>5.0</td>
</tr>
<tr>
<td>7x7 cm</td>
<td>6.0</td>
</tr>
<tr>
<td>12x12 cm</td>
<td>8.0</td>
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</tbody>
</table>
Scatter Impact on Flap of 2D Array

with vs without a bolus of 2 to 8 cm

An 8-cm bolus used and an ion chamber placed at depth 1.5 to 9 cm
Advantages

- Convenient, noninvasive tech for skin lesions
- Very good cosmetic output
- Short treatment time
- Easy to implement
- Any site: Head, neck, breast, arms, legs, ...
- Intraoperative option
- Reimbursement