Application of Freiburg Flap in Skin HDR Brachytherapy

B. Li, K. Dou, B. Laser, M. Jacobs, M. Seidel, M. Sarfaraz

MedStar RadAmerica and Mercy Radiation Oncology
Baltimore, MD
Case Study #1: Post-Surgery Keloids

Timeline

2004
Keloids developing after bilateral breast reduction procedure

2005
Underwent revision, however keloids recurring and continuing to progress
Case Study #1: Post-Surgery Keloids

2013
Keloids extending, patient reporting extreme discomfort and pain, referred to radiation oncology by her dermatologist

Treatment Goals
To relieve discomfort and pain
To control obstinate recurrence of keloids
Treatment Planning Considerations

• **Electron Beam Therapy**
  – Very difficult to match abutting electron fields
  – Very challenging to plan due to sloping surfaces

• **HDR Brachytherapy**
  – with a surface applicator
Nucletron Surface Applicator: Freiburg Flap

Flexible mesh style surface mold

24cm X 36cm

1cm Apart from each channel

Flexible Implant catheters and buttons
Freiburg Flap
w/ 1 cm beads
Freiburg Flap Advantages

• Cut to any size for treating lesions of various sizes/sites

• **Conform to curved shape**, allowing dose distribution conforming to the target with curvature slope

• Graphical and point optimization available

• **Reusable**, and Sterile for **Intra-Operative use**
HDR vs. EBT Plan

HDR
- Good dose conformity
- More skin dose >100%

EBT
- Hot area beyond PTV
- Less skin dose <100%
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
Protocol Development for Freiburg Flap

- Preparation
  - CT simulation
  - Dosimetry Planning
  - Physics QA

- Treatment Delivery

- Outcome
Planning Worksheet

Mercy Medical Center Radiation Oncology
HDR Freiburg Flap Applicator Planning Worksheet

Patient Name: __________________________ Chart No.: ________________ Plan Date: ________________

Planned by: ___________________________ Plan Date: ________________

Lesion and Flap Location:

Plan Goal:

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<tr>
<th>Target</th>
<th>V90</th>
<th>V95</th>
<th>Skin</th>
<th>Chest Wall</th>
<th>Lung</th>
<th>Heart</th>
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MROC Freiburg Flap Applicator Numbering Worksheet

Patient Name: __________________________ Chart No.: ________________ CT Date: ________________

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Physician/Dosimetrist: __________________________ Date: ________________

Physician: __________________________ Date: ________________
CT Simulation

Water heater
CIVCO 12x18 inch thermoplastic mask
CIVCO Rail frame
CIVCO VacFix/Wing board
CT Simulation

Thermoplastic mask for chest
CT Simulation

Sewing the flap on the mask
CT Simulation

Marking PTV on Patient
CT Simulation

Marking PTV on Flap
Confirming PTV Match
WIRE ON SKIN

WIRE ON FLAP

Mismatch, must adjust
WIRE ON SKIN

WIRE ON FLAP

PTV match confirmed
Dosimetry Planning

1. Contouring - Using Eclipse (or Oncentra)
2. Catheter Reconstruction
3. Activation
4. Normalization
5. Optimization
6. Prescription

Using Oncentra
Contouring

**Cannot** reply on auto skin contouring due to the presence of flap.
Contouring

**Manual** skin contouring needed for accurate results.
PTV Contour

5mm Depth
Critical Structure Contour
Catheter Reconstruction
Catheter Reconstruction
Activation

3D Dwell position activation
### Activation

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Normalization
Normalization
Normalization
Optimization
Optimization
## Prescription

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<td><strong>Dose</strong></td>
<td>4 Gy x 3 = 12 Gy</td>
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<td><strong>Depth</strong></td>
<td>5mm</td>
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<td><strong>Pattern</strong></td>
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| **Target** | V90 > 90%  
V95 > 95% | V90 > 90%  
V95 > 95% |
| **OARs** | Skin < 125%  
Chest wall < 125% | Skin < 145% |
Treatment Delivery
Treatment Outcome

Pre- Surgery

Surgery Day

A Month Follow Up
Case Study #2: Keloids
Case Study #3: Squamous Cell Carcinoma

Pre – Treatment

5th Treatment
Case Study #4: Breast Cancer
Summary

• Successful implementation of Freiburg flap
  – Developed treatment planning protocols
• Satisfactory clinical and cosmetic outcome in all cases
  – Keloids, skin and breast cancers

HDR Brachytherapy with a surface applicator
  – Effective, noninvasive for skin lesions of many sites
  – Easy to implement and short treatment time
Thank You!