Superficial Radiation Therapy

“Radiation Therapy Update”

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Introduction

- Epidemic of Non Melanoma Skin Cancer in the US and around the world
- Recent study in South Florida showed some of the highest incidences of NMSC*:
  - 466.5 per 100,000 people per year in the “commercial” (age 0 to 65) population
  - 10,689.8 per 100,000 people per year in the Medicare age population
- High ratio of SCC to BCC
- Dermatologists need to optimize treatment options


Introduction II

- Traditional treatment options for NMSC include:
  - Excision
  - Moh’s Micrographic Surgery
  - Electrodesication and Curettage
  - Cryosurgery
  - Topical therapy (5 FU, Iimiquimod, PDT)
  - Superficial Radiation Therapy (SRT)*
- Historically, SRT has been one of the primary treatments for NMSC by dermatologists until approximately 1970.

Introduction III

History of SRT in Dermatology

- “Radiation Therapy” was born in the 1890’s and in 1899 first treatment of Basal Cell Carcinoma in Sweden.
- Brocq, in Paris began investigating RT for Dermatology and was responsible for “Radiotherapy in Skin Disease” by Belot in 1904.
- Over the next 20 years Dermatologists in Germany and throughout Europe and the US began using RT to treat a variety of skin problems including skin malignancies
- In 1921, George Miller MacKee published “X Rays and Radium in the Treatment of Disease of the Skin” for treatment of skin tumors in addition to Pyoderma, tinea, hypertrichosis, psoriasis, LP, nevi etc.

Introduction III

History of SRT in Dermatology

- Next 30 years was the “golden age” of SRT in dermatology
- Most Dermatologists had training in residency an used SRT in office
- Everything from Eczema to Acne was treated and sequelae began to appear
- In 1974 a comprehensive survey by the AAD “Task Force on Ionizing Radiation of the National Program for Dermatology”:
  - 55.5% of dermatology offices had superficial x-ray and/or Grenz-ray
  - 44.3% of dermatologists used them regularly.
- Residency training in RT was considered good or adequate by 59.6%, and 18.3% received no practical training.
Introduction IV

History of SRT in Dermatology
- During 1970's Dermatologist slowly stopped using SRT and residency training in SRT declined:
  - No new equipment
  - Old XRT equipment was breaking down
  - No reasonable sources of new technology
  - Teaching departments did not replace equipment
  - Decreased Residency Training
  - No new devices
  - Teachers retired
  - Increase in cutaneous and Moh's surgery
  - Better surgical training
  - Better cure rates?
  - Improved reimbursement
  - Radiation Oncologists took over RT treatment

Introduction V

SRT in Dermatology: Back to the Future
- Need for SRT in Dermatology:
  - Dramatic increase in NMSC
  - Comorbidities, anticoagulation in aging population
  - Increased larger tumors in difficult areas such as tibial and scalp
  - Perceived overutilization and decreased reimbursement of Moh’s
  - Need to make sure that Dermatology has access to all modalities
  - SRT offers high cure rate low morbidity and scarring

Introduction VI

SRT in Dermatology: Back to the Future
- No need for Radiation Oncologists or Radiation Physicist
- New Technology and Treatment paradigms
- New computerized treatment systems for accuracy and safety
- Physician extenders: PA, NP
- New fractionation methodology
- New indications for Dermatology: Keloids*

Essentials of Radiation Oncology

Treatment Modalities for Skin Cancer I
- Electron Beam: External direct radiation (range 6-20 MeV),
  - Need higher energies for equal efficacy
  - Maximum deposition near surface but affects deeper tissue so more acute and latent affects
  - Expensive equipment
  - Commonly used by Radiation Oncologists
  - Lower cure rates and increased morbidity vs. SRT

Essentials of Radiation Oncology

Treatment Modalities for Skin Cancer II
- Brachytherapy: Radiation source (isotopes) applied directly on tumor.
  - HDR brachytherapy lasts few minutes.
  - LDR brachytherapy source stays in place up to 24 hours
  - Effective and low side effects
  - Treatment restrictions (Bunker)
  - Need Radiation Oncologist
  - Consumables $80,000 per year

- Electric Brachytherapy: New Devices
  - Penetrates the top surface layer of the skin, avoiding deep tissue damage which minimizes scarring
  - Energy is deposited in a uniform distribution and lower total doses, thus decrease in latent reactions.
  - Utilizes a miniature, consumable, non-isotopic 50 kV source
  - Applicator up to 50 mm
  - Collaboration with Radiation Oncologists and Radiation Physics
  - Excellent short term cure rates, few if any long term studies
  - Controversy over codes, T code not paid in all states
Superficial Radiation Therapy*: Low energy radiation beam (X-ray)
- Penetrates the top surface layer of the skin, avoiding deep tissue damage which minimizes scarring
- Energy is deposited in a uniform distribution and lower total doses, thus decrease in latent reactions.
- Non consumable source up to 100Kv
- Applicator up to 180 mm lesions (Keloid)
- Most often used by office based Dermatologists, no need for Radiation Oncologists or Radiation Physics
- High long term cure rates for primary BCC and SCC
- Codes approved in all states

Literature Review

Introduction
- Consider: Indications, Long Term Cure Rates and Cosmesis
- Challenging to compare the studies
  - BCC vs. SCC
  - Various treatment protocols
    - Different energy levels
    - Different number of fractions
  - Compare to other treatment methods
    - Different RT
      - Electron Beam (Used by RT)
      - Brachytherapy (Traditional and Electronic)

History
- Superficial x-ray therapy has been successfully used to treat skin cancers for over a century.
  - X-rays were discovered by Wilhem Conrad Roentgen in November 1895.
  - Seven months after Roentgen’s discovery, Victor Despeignes used radiotherapy to treat a patient with gastric carcinoma.
  - At the same time, Dr. Emil Grubbe claimed to have been the first to treat cancer patients with x-rays in 1896.
  - Dr. Thor Stenbeck and Dr. Tage Sjogren of Sweden reported successes with treating skin cancers by 1899.
- In its infancy, recurrence rates were high and long term sequelae was unfavorable.

SRT for NMSC
Retrospective Review I
- A retrospective study of 604 BCC and 106 SCC irradiated between 1971–96.
- The 5-year cure rates were 94.4% for BCC and 92.7% for SCC
- The recurrence rates for BCC and SCC were 11.5 and 16.5 per 1000 patient-years, respectively
- Tumor location on the nasolabial fold and tumor size ≥ 10 mm were independent predictors of increased BCC recurrence.
- SRT is effective treatment for BCC and SCC and should be considered as a first option.


SRT for NMSC
Retrospective Review II
- A retrospective analysis on 1715 histologically confirmed primary cutaneous BCC and SCC treated with SRT between 2000 and 2010.
- 712 BCC (631 nodular and 81 superficial), 994 were SCC (861 SCC in situ and 133 invasive SCC), and 9 features of both BCC and SCC
- Cumulative recurrence rates of all tumors at 2 and 5 years were 1.9% (1%-2.7%) and 5.0% (3.2%-6.7%), respectively;
  - BCC were 2% (0.8%-3.3%) and 4.2% (1.9%-6.4%),
  - SCC were 1.8% (0.8%-2.8%) and 5.8% (2.9%-8.7%),
  - Male patients and greater than 2 cm increased recurrence.
- Energy: Approximately 3500, Fractions 5 - 8
- Conclusion: SRT viable nonsurgical option for BCC and SCC

Basal Cell Carcinoma
- A 40 year review of the literature in 1989
- Pooled 4,695 patients with BCC
- Various Energy and Fractions
- Average five year cure rate: 91.3%
- Follow up 2-5 years


Basal Cell Carcinoma
- 454 BCC’s (6% recurrent) primarily on the head and neck, few on the trunk and extremities
- Cure Rates 95%
  - 5 mm margins and 10 mm margins for large BCC’s.
  - Energy and Fractions: 6 to 48 Gy given in 1 to 12 fractions
- Recurrence rate - 5% (7 year follow up)
- Side effects: Mild atrophy, telangiectasias and pigmentary changes
- Cosmesis: Good


Basal Cell Carcinoma
- Retrospective study of 233 BCC’s, some recurrent, primarily on the face and scalp, few on the trunk and extremities
- Cure Rates
  - Cure rate in untreated lesions - 90%
  - Cure rate in recurrent lesions - 80%
  - Multiple fractions (Average of 10)
  - >40 Gy to <60 Gy depending on size of the lesion
  - Median follow-up time was 5.8 years
- Side Effects
  - Long term: Soft tissue necrosis 2%, cartilaginous necrosis in 1 lesion, bone necrosis in 2 lesions
  - 92% good or excellent cosmetic result
- Local tumor control, cosmesis, and complications are related to the size of the primary lesion.


Basal and Squamous Cell Carcinoma
- 1267 lesions (1019 BCC and 245 SCC and 3 mixed)
- Energy: 45 - 60 Gy
- Fractions: 9 - 10
- 5-Year Cure Rates - 94.8 % BCC and 90.4% SCC
  - 2.4% of all tumors recurred at the margin of the irradiated field
- Side Effects
  - Hypopigmentation - 72.7%
  - Telangiectasias - 51.5%
  - Erythema - 44.5%
  - Hypopigmentation - 23.4%


Squamous Cell Carcinoma
- Meta-analysis of 14 retrospective studies
- Pooled 1018 primary SCCs
- Various energies and fractions
- Average local cure rate - 93.6%
- Average local recurrence - 6.4%
- Follow up 2-5 years

Cosmesis

- Difficult to assess and quantify
- Patients treated with radiotherapy had good to very good cosmetic results
- Optimal cosmetic results occur when the overall dosage is divided among a higher number of fractions
- Particularly favorable cosmesis on the nasal alar rim and perioral and periorbital areas
  - No retraction of the lip or ectropion of the eyelid
  - Most common cosmetically unfavorable side effects
    - Hypopigmentation
    - Increase in telangiectasias within long-standing treatment areas


Cosmesis

- 10 year evaluation after superficial XRT for BCC
  - Of 47 elderly patients, 12 are alive with no recurrence
  - Self rated on a scale consisting of: excellent, very good, good, mediocre, and poor.
    - 6 of the 12 rated their cosmetic appearance as excellent
    - 3 of 12 considered it very good
    - 3 of 12 rated their cosmetic appearance as good
  - Overall, patients appear to be pleased with the results


Superficial Radiation Therapy (SXRT) Versus Electron Beam Therapy (EBT)

- SXRT energy source is light (rather than a charged particle)
- SXRT machines are smaller and less expensive and linear accelerator is not required
- The beam and delivered dose with SXRT have far less lateral edge beam drop-off in the umbra of the treatment site (may contribute to inferior cure rates of EBT)
- SXRT more cost-effective in terms of equipment and patient costs


Cure Rates According to External Beam Technique

<table>
<thead>
<tr>
<th>Size of the Carcinoma</th>
<th>Superficial XRT BCC Cure Rate</th>
<th>Electron Beam Therapy BCC Cure Rate</th>
<th>Superficial XRT SCC Cure Rate</th>
<th>Electron Beam Therapy SCC Cure Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 cm</td>
<td>97% (69/71)</td>
<td>92% (11/12)</td>
<td>100% (12/12)</td>
<td>79% (3/4)</td>
</tr>
<tr>
<td>1 – 1.5 cm</td>
<td>95% (84/88)</td>
<td>73% (16/22)</td>
<td>91% (10/11)</td>
<td>75% (7/10)</td>
</tr>
<tr>
<td>&gt; 1 cm</td>
<td>100% (4/4)</td>
<td>80% (4/5)</td>
<td>100% (1/1)</td>
<td>75% (1/4)</td>
</tr>
</tbody>
</table>

To treat cutaneous malignancies, radiation oncologists apply a tissue-Eric Bragg single dose of beam energy to the target area. EB-T is also known as skin sparing which is beneficial in treating internal lesions.

Electron beam therapy may mutagenically alter cells in areas receiving less than a tumoricidal dose in the center of the field. EB-T is also known as skin sparing which is beneficial in treating internal malignancies. To treat cutaneous malignancies, radiation oncologists apply a tissue-equivalent material called a bolus to the skin to shift the efficacious portion of the beam higher towards the skin surface. If the skin-sparing nature is not compensated for in an appropriate way, more recurrences can be expected.

HDR Brachytherapy
- Placement of radioactive sources directly onto or into target tissues
- Low Cure Rates seen with NMSC exceeding 2 mm in depth and greater than 2 cm in diameter.
- Recurrence rates between 0% and 10% in ideal candidates
- It requires expensive hardware such as various applicators and sophisticated HDR afterloading equipment.
- It involves potential risks of radiation exposure to medical personnel.

Cure Rate Comparisons

<table>
<thead>
<tr>
<th>Study Site Studied Lesion Type</th>
<th>Modality</th>
<th>Treatment Time</th>
<th>Dosage</th>
<th>Follow-up (mo)</th>
<th>Recurrence Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rio et al Face SCC (88/97)</td>
<td>Superficial XRT</td>
<td>165 h</td>
<td>5700-9600/1488</td>
<td>72</td>
<td>3/136</td>
</tr>
<tr>
<td>Ozyar and Semrau et al Scalp SCC (1/1)</td>
<td>HDR surface</td>
<td>86 h</td>
<td>6000-6500/196</td>
<td>240</td>
<td>&gt;36</td>
</tr>
<tr>
<td>Rudoltz et al Forearm, back of hand BCC (16/53)</td>
<td>HDR mold</td>
<td>4000</td>
<td>43 (mean)</td>
<td>2/54</td>
<td></td>
</tr>
<tr>
<td>Lee et al Various SCC (3/5)</td>
<td>HDR surface</td>
<td>6000-6500/15-2 h</td>
<td>30-1 h</td>
<td>3/370</td>
<td></td>
</tr>
<tr>
<td>Debois Nose Epiderm (60/370)</td>
<td>HDR mold</td>
<td>30 min-1h</td>
<td>6000-6500/1-3</td>
<td>51 (mean)</td>
<td>0/53</td>
</tr>
<tr>
<td>Conill et al Lip SCC (52/54)</td>
<td>HDR mold</td>
<td>6000-6500/3-8 min/session</td>
<td>4000-6000/1-3</td>
<td>51 (mean)</td>
<td>0/53</td>
</tr>
<tr>
<td>Conill et al Eyelid SCC (4/24)</td>
<td>HDR mold</td>
<td>3-8 min/session</td>
<td>7500-8000/10 (&gt;4 cm)</td>
<td>60</td>
<td>3/136</td>
</tr>
<tr>
<td>Berridge and Shields et al Eyelid BCC (2/8)</td>
<td>HDR mold</td>
<td>30 min-1 h</td>
<td>7500-8000/10 (&gt;4 cm)</td>
<td>60</td>
<td>3/136</td>
</tr>
<tr>
<td>Somanchi et al Back of hand, Met car (1/8)</td>
<td>HDR mold</td>
<td>Not stated</td>
<td>4050/ multiple</td>
<td>72</td>
<td>0</td>
</tr>
<tr>
<td>Svoboda et al Various Other (19/106)</td>
<td>HDR mold</td>
<td>Not stated</td>
<td>6600/&gt;33 24</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Stucki et al Forearm, back of hand BCC (300/370)</td>
<td>HDR mold</td>
<td>Not stated</td>
<td>6000-6500/33-36</td>
<td>48</td>
<td>11/368</td>
</tr>
<tr>
<td>Avril et al Face BCC (30/30)</td>
<td>LDR surface</td>
<td>86 h</td>
<td>6000-6500/196 (mean)</td>
<td>2/54</td>
<td></td>
</tr>
<tr>
<td>Rudoltz et al Forearm, back of hand BCC (9/97)</td>
<td>LDR mold</td>
<td>4000</td>
<td>43 (mean)</td>
<td>2/24</td>
<td></td>
</tr>
<tr>
<td>Berridge and Shields et al Eyelid BCC (2/54)</td>
<td>LDR interstitial 54-55 h (total)</td>
<td>4000</td>
<td>43 (mean)</td>
<td>2/24</td>
<td></td>
</tr>
<tr>
<td>Berridge and Shields et al Eyelid BCC (2/54)</td>
<td>LDR interstitial 86 h</td>
<td>6000-6500</td>
<td>48 h (total)</td>
<td>2400</td>
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<td>51 (mean)</td>
<td>0/53</td>
<td></td>
</tr>
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</table>

**Superficial X-Ray Therapy versus Electron Beam Therapy**
- Electron beam therapy was the primary therapy for cutaneous malignancies or as adjunctive therapy for aggressive cutaneous malignancies.
- Squamous cell carcinoma was the predominant primary and secondary malignancy to develop.

**Superficial X-Ray Therapy versus Electron Beam Therapy**
- 7 patients developed multiple secondary tumours arising within and immediately around the electron beam treatment sites.
- Electron beam therapy was the primary therapy for cutaneous malignancies or as adjunctive therapy for aggressive cutaneous malignancies.

**Superficial X-Ray Therapy versus Electron Beam Therapy**
- Favorable cosmesis, especially on the nose and perioral and periorbital areas
- Most common long term side effects - hypopigmentation and telangiectasias
- Electron Beam Therapy
- Less favorable cosmesis
- Most common long term side effects - alopecia and hyperpigmentation

**Cure Rate Comparisons**
- Table below represents BCC local tumor control by modality and size
- Combination = HDR Brachytherapy
- Electron Beam = Electron Beam Therapy
- Photons = X-Ray Therapy
- Superficial = Superficial X-Ray Therapy
- Versus Electron Beam Therapy
- 

**Cosmetics**
- Favorable XRT
- Least favorable EB-T
- 

**Long Term Side Effects**
- Combination = HDR Brachytherapy
- Electron Beam = Electron Beam Therapy
- Photons = X-Ray Therapy
- Superficial = Superficial X-Ray Therapy
- Versus Electron Beam Therapy
- 

**Cure Rate Comparisons**
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- Photons = X-Ray Therapy
- Superficial = Superficial X-Ray Therapy
- Versus Electron Beam Therapy
- 

**Cosmetics**
- Favorable XRT
- Least favorable EB-T
Electronic Brachytherapy
- 122 patients with 171 NMSC lesions
- 40 Gy in eight fractions, delivered twice weekly
- Followed up to 1 year
- Cure rates 100%
- Cosmesis good


Electronic Brachytherapy
- Two prospective, single-center, non-randomized, pilot studies.
- 20 patients were treated in each study: (1) 36.6 Gy in 6 fractions of 6.1 Gy, (2) 42 Gy in 6 fractions of 7 Gy.
- At 1 year 90% response in group 1 and 95% in group 2
- Good cosmesis


Electronic Brachytherapy
- 1,822 treated lesions from 2009 to 2014 in patients ranging in age from 52 to 104 years.
- BCC (57%) or SCC (38%) less than 2cm in size (97%)
- 40 to 45 Gy using mostly 8 fractions
- Less than 1% recurrence but median follow-up only 4 to 16 months
- Good cosmesis


SRT for Recurrent Keloid Scars
- Hypertrophic and Keloid scars are common especially in certain ethnic populations
- Symptomatic causing significant itching and pain
- Treatments consist of topical preparations and injectables such as TAC and 5 FU but are not very successful
- Surgical excision is effective but has a very high recurrence rate
- Post operative treatment with SRT can significantly reduce recurrences

DNA / RNA Damage due to Ionizing Radiation
- Inability for cells to proliferate
- Inability for cells to survive
- Induction of mutations
- Apoptosis or malignancy

Keloid Recurrence Rates

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Ethnicity</th>
<th>#Patients</th>
<th>% of Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morin</td>
<td>2012</td>
<td>Black</td>
<td>12</td>
<td>87%</td>
</tr>
<tr>
<td>Ardiz</td>
<td>2010</td>
<td>White</td>
<td>14</td>
<td>86%</td>
</tr>
<tr>
<td>Chmiela</td>
<td>2006</td>
<td>White</td>
<td>26</td>
<td>85%</td>
</tr>
<tr>
<td>Chmiela</td>
<td>2010</td>
<td>White</td>
<td>25</td>
<td>54%</td>
</tr>
<tr>
<td>Cosenza</td>
<td>2007</td>
<td>White</td>
<td>28</td>
<td>27%</td>
</tr>
<tr>
<td>Haferlik</td>
<td>2008</td>
<td>White</td>
<td>198</td>
<td>80%</td>
</tr>
<tr>
<td>Haferlik</td>
<td>2009</td>
<td>White</td>
<td>47</td>
<td>91%</td>
</tr>
<tr>
<td>Apolatzi</td>
<td>2010</td>
<td>White</td>
<td>114</td>
<td>80%</td>
</tr>
<tr>
<td>Sartori</td>
<td>2009</td>
<td>White</td>
<td>83</td>
<td>33%</td>
</tr>
<tr>
<td>Bottem</td>
<td>2004</td>
<td>White</td>
<td>18</td>
<td>56%</td>
</tr>
<tr>
<td>Andersson</td>
<td>2005</td>
<td>White</td>
<td>67</td>
<td>56%</td>
</tr>
</tbody>
</table>

Weighted Average Recurrence = 71.2 %
Post-Excision Radiation & Keloids

In a retrospective study of 80 keloidectomy patients treated with postoperative single-fraction 10Gy radiotherapy:

- 9% of keloids relapsed after 1 year
- 16% of keloids relapsed after 5 years


Post-excision Radiation Of Auricular Keloids

- Retrospective study of suturing lines of 60 keloidectomy patients (76 ear keloids)
- Treated 1-3 days post-operatively with 5 Gy/wk, 25-45 Gy total dose, contact or superficial radiotherapy
- Mean follow-up 47.85 months
- 5 year relapse-free rate of 79.84%
- No pigmentation or telangiectasias


Superficial Radiation Therapy for the Prevention of Keloids After Surgery

- A BED value of 30 Gy can be obtained with:
  - a single acute dose of 13 Gy
  - two fractions of 8 Gy
  - three fractions of 6 Gy
  - a single dose of 27 Gy at low dose rate
- The radiation treatment should be administered within 2 days after surgery

Kol HH, Veen RE. Keloid Dose and Fractionation Schemes

Superficial Radiation Therapy (SRT) Post-Keloidectomy

SRT Ports for Large Keloid Excision Site Treatment
Superficial Radiation Therapy (SRT) Post-keloidectomy

- Chest keloid Pre-excision
- 1 month post-excision
- SRT 6 Gy on POD 1, 2, 3

Superficial Radiation Therapy for the Prevention of Keloids After Shave Excision

- Small study
- 5 month follow up
- 3 treatments after secondary intention healing 69 days after excision
- No recurrence

Keloid Excision + Radiation: Fibrosarcoma 3.5 Years Later

- In 1963 a 23 yo woman received 22 Gy low energy (80 kV-rays) radiation after excision of keloids on her thigh
- 3 ½ years later a fibrosarcoma was found in that area
- Although keloidal tissue may have possibly underwent malignant transformation, the author noted that 3 ½ years may be too short for this to occur

Keloidectomy And E-beam Radiotherapy

- Treated 91 keloids with by a combination of surgical excision and postoperative electron beam radiation 20 Gy: 5 Fractions (Ear: 16 Gy: 4 Fractions)
- 44% keloid recurrence rate (include symptoms)

Radiation And Keloid Recurrence

- 44% keloid recurrence with manual postoperative teletherapy: keloid recurrence after 6-7 years, but no recurrence in the 6-month follow-up visit.
- Biologically effective doses of postoperative radiotherapy in the prevention of keloids. Dose–effect relationship. Kal HB, von B, Klein RE. Strahlenther Onkol. 2005; 181: 717-23. In this review, a radiotherapy regimen resulting in a biologically effective dose of at least 30 Gy is recommended to be administered, starting within 2 days after surgery. For keloid measures, the minimum biologically effective dose is less than 10 Gy.

Our Protocol

- Consult with patient and review treatment options
- If recurrent keloid by history recoment excision followed by SRT
- Obtain referral for all procedures
- Excise on day 0 and use SRT on POD 1, 2, 3 each 6 Gy
- PO care use silicone gel
SRT: Clinical Experience

SRT for NMSC
Clinical Paradigms
- Patient Selection
  - Age
  - Medical Status
  - Co-morbidities
  - Anticoagulation
  - Patient preference
- Tumor Selection
  - Type
  - Recurrence
  - Size
  - Location
  - Other mitigating factors

SRT for NMSC
Clinical Paradigms II
- Treatment algorithms
  - Energy
  - Margins
  - Fractionation
  - Schedule
- Patient safety
  - Shielding
  - Comfort
- Quality and regulatory compliance

SRT for NMSC
Our Clinical Experience I
- Installed June 2012
- Room Preparation, installation and inspection
- Training for myself and staff
- I evaluate, PA’s treat
- Approximately 500 NMSC to date with optimal fractionation protocols (approximately 10% of NMSC treated)
- 2 recurrences to date
- Good to excellent cosmesis

SRT for NMSC
Our Clinical Experience II
- Patient comfort and safety paramount
- Primary indications
  - BCC and SCC
  - Scalp, lower legs, nose
  - Elderly with co-morbidities
- Average 15 fractions, 3 times a week

SRT: Clinical Examples
Simulation and Treatment

- A custom lead shield of 0.762mm thickness is used to form a molded, custom shield with a port to correlate with lesion size, including treatment margin.
- Additional shielding is used to protect sensitive, normal tissues (intranasal, intraoral, ear canal).
- Total dose of radiation calculated based on applicator size and total fractionation dose and divided into an average of 15 fractionations either 3 or 5 times a week.
Conclusions

- Historically, RT has been one of the primary treatments for NMSC by dermatologists but use has decreased over time and have been delegated to Radiation Oncologists.
- Changing demographics, decreasing surgical reimbursements, increasing NMSC and new innovations in equipment and techniques bring SRT back to Dermatology.
- Significant literature on benefits of SRT and more recent literature on eBT.
- New fractionation methods improve therapeutic index with high cure rates and low acute and latent side effects especially in difficult treatment areas such as scalp and lower extremities without scarring.
- Dramatic reduction in Keloid recurrences.
- Computerized technology and the ability to use physician extenders allows for efficiency in an office base practice.