Practice and Educational Gaps in Radiation Therapy in Dermatology

Armand B. Cognetta Jr, MD[a], Christopher M. Wolfe, DO[a,*], David J. Goldberg, MD, JD[b,c], Hyokyoung Grace Hong, PhD[d]

KEYWORDS

• Superficial radiation treatment • Superficial radiotherapy • Dermatologic radiotherapy
• Nonmelanoma skin cancer • Basal cell carcinoma • Squamous cell carcinoma
• Treatment selection criteria • Appropriate use criteria

KEY POINTS

- Superficial radiation therapy has more than 106 years of research and development by dermatologists.
- Compared with hospital-based radiation therapy delivered by radiation oncologists, superficial radiation delivered in the outpatient dermatologic setting is the least expensive form of radiation treatment.
- Superficial radiation therapy is currently an underused modality in the treatment of nonmelanoma skin cancer.
- With the aging, feeble population it is vital to keep this cost-efficient modality within the hands of dermatologists.

Superficial radiation therapy (SRT) has been the standard of care for office-based radiation treatment of nonmelanoma skin cancers (NMSC) for more than 100 years. This began with Leopold Freund (acknowledged as the father of radiation therapy [RT]), with a continuous lineage from him to Pusey, MacKee, Cippolaro, Goldsmith, Gladstein, Panizzon, and Kopf. SRT was an integral part of dermatology practices for the better part of the 20th century until the mid 1980s, when the popularity of Mohs surgery and the cessation of manufacturing of new and modern SRT platforms led to a decrease in the popularity of SRT. An American Academy of Dermatology (AAD) task force in 1974 concluded that 55% of dermatology offices used SRT and 44% of dermatologists used SRT regularly.

The physics of SRT are less complex than any laser/light platform in use by dermatologists today. X-rays are part of the electromagnetic spectrum beginning just beyond the ultraviolet spectrum. Dermatologists have embraced and pioneered use of the entire electromagnetic spectrum. From conception, design, and fine tuning, to use, SRT remains within the purview of dermatologic therapy. Dermatologists consider themselves

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[a] Division of Dermatology, Florida State University College of Medicine, Tallahassee, FL, USA; [b] Skin Laser & Surgery Specialists of NY and NJ, USA; [c] Department of Dermatology, Mt. Sinai School of Medicine, New York, NY, USA; [d] Department of Statistics and Probability, Michigan State University, East Lansing, MI, USA
* Corresponding author. 604 Tree Duck Court, Greensburg, PA 15601.
E-mail address: wolfe1pa@gmail.com

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cutaneous oncologists, using imaging, targeted therapy, immunotherapy, surgery, and primary as well as adjunctive radiotherapy to treat skin cancer. With the aging, feeble population it is vital to keep this cost-efficient modality within the hands of dermatologists.

Dermatology has played a pivotal role in the conception and development of many other subspecialties such as rheumatology, venereology, cosmetic surgery, and radiation oncology. Long before the American Club of Therapeutic Radiologists was formed in 1962, (the precursor to the American Society for Therapeutic Radiology and Oncology [ASTRO]),[1] dermatologists were pioneering the use of RT and brachytherapy. A de facto relinquishment of SRT to radiation oncologists would be comparable with (1) relinquishment of laser therapy to plastic surgeons because it falls within the realm of cosmetic treatment, (2) Mohs surgery to general and plastic surgeons simply because it is surgery, or (3) dermatopathology to general pathologists.

BEST PRACTICES IN DERMATOLOGIC RADIOTHERAPY

Best practice includes consensus development based on best evidence formulated by dermatologists with the most experience using a particular radiation modality. This practice includes the creation of a treatment algorithm for NMSC and incorporation of SRT into the treatment algorithm for the population over the age of 65. At present, guidelines exist based on past research, though no appropriate use criteria (AUC) have been developed. The most critical aspect of SRT use is appropriate patient and tumor selection.

The following are proposed SRT AUC for basal cell carcinoma (BCC)/squamous cell carcinoma (SCC) treatment that are accepted by experienced dermatology radiotherapists in the past and present:

1. Location: central face, including the eyelids, nasal tip, nasal ala, ears, lips.[2–34]
2. Age $\geq$60 years: to minimize the synergistic effects of ultraviolet radiation and late sequelae.[35–40]
3. Tumor size: tumors up to 5 cm in diameter may be adequately treated with SRT.[10,41–45]
4. Tumor type/depth of invasion: superficial and nodular BCCs, SCC in situ, and SCC that are nonaggressive are amenable to SRT.[6,42,43,46]
5. Frailty and medical status: inability to tolerate surgery owing to poor health, multiple comorbidities, or those on anticoagulant therapy may have a higher risk of adverse surgical events. Eastern Cooperative Oncology Group performance status[47] may be used to document selection of radiotherapy over surgery.
6. Patient preference to avoid surgery may be a consideration and in cases where surgery will lead to skin graft or complex flap closure.

Absolute (1–4) and relative (5,6) contraindications for SRT include the following:

1. Aggressive tumor histology: BCCs (sclerosing, morpheaform, infiltrative), SCC (perineural invasion, arising in previous sites of RT, burn scars, chronic ulcers, spindle cell carcinoma, poorly/undifferentiated, or those secondary to osteomyelitis).[6,42,43,46,48–51]
2. Deep tumor invasion: tumors that invade bone, cartilage, or arise within the mucosal surfaces (intranasal/intraoral).[52,53]
3. Previously irradiated site: increases incidence of late-term sequelae (ulcer, radionecrosis of cartilage and bone) results in unsatisfactory cosmesis, recurrence, and second primary tumors.[48,49,54,55]
4. Genetic anomalies: nevoid BCC syndrome, xeroderma pigmentosum, Garner's syndrome, Li–Fraumeni syndrome, and others with increased radiosensitivity or where radiation may induce new malignancies.[56–63]
5. Organ transplant recipients: the mainstay of treatment is surgical excision or Mohs surgery.
6. Location on the trunk or extremities: early pioneers of SRT recommended against the use of radiotherapy on the trunk and extremities owing to late sequelae changes (telengiectasias and pigmentary changes), lower oxygen saturation leading to potential decreased efficacy and wound healing issues, and the general ease and expediency of surgical removal.[44,64–69]

ESTIMATE OF CURRENT PRACTICE

The 1974 AAD Task Force on Ionizing Radiation conducted a comprehensive survey sending a detailed questionnaire to 4560 dermatologists in the United States and Canada. Of the 2444 replies, 44% of respondents (1075) reported using radiotherapy weekly.[70] Superficial x-ray or Grenz-ray equipment was reported to be available in 55.5% of dermatologic offices. A larger pool of dermatologists in the past had considerable experience with the use of in-office radiotherapy and helped to shape, by their use and research, the guidelines in use today. Recently, there has been a noticeable resurgence in the interest and use of SRT by dermatologists with the reintroduction of more modern, user-friendly, and safer equipment.