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RT plays a role in the treatment of BCC and SCC of the head and neck.

Management of BCC and SCC of the Head and Neck

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Background: *For decades radiotherapy (RT) has been shown to treat skin cancers; however, the indications, delivery methods, and techniques for RT continue to evolve.*
Methods: *Relevant prospective and retrospective reports were reviewed that addressed outcomes with, indications for, and delivery techniques used with RT for the management of cutaneous basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) of the head and neck.*
Results: *Rates of local control higher than 90% are typically achievable for early-stage BCC and SCC of the head and neck. RT is often recommended for tumors located in cosmetically or functionally sensitive areas of the face, for patients who cannot tolerate anesthesia, for those taking anticoagulants, or for patients who prefer RT to other treatment options. A wide range of radiation doses, daily fractionation schedules, and radiation techniques have been shown to be effective for management. In general, postoperative local radiation is recommended following excision for patients with high-risk factors, including those whose tumors have close or positive margins, perineural invasion, invasion of the bone or nerves, or those with recurrent disease.*
Conclusions: *RT plays an integral role in the treatment of primary and postoperative cutaneous BCC and SCC of the head and neck. Prospective trials are in progress to address the roles of concurrent systemic therapy and RT for both cutaneous BCC and SCC.*

Introduction

An estimated 5.4 million cases of cutaneous basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) are diagnosed every year in the United States — a number that is more than all other types of cancer combined.[1] Many factors play a role in the development of cutaneous SCC and BCC, and the incidence of these cancers is also rising as a result of increased exposure to ultraviolet light or sunlight, changing clothing styles, and increasing longevity.[2-4] The socioeconomic burden of these cancers is often underestimated because BCC and SCC are frequently excluded from cancer registries.[1,3,5] Cutaneous BCC and SCC typically present locally — rather than regionally or distant — and may be curable with local management.

Cutaneous BCC arises from pluripotent cells in the basal layer of the epidermis and tends to develop following exposure to the sun during childhood.[2,6] BCC often presents as slow-growing, translucent papules with raised, telangiectatic borders on the head and neck. Rarely, the tumors metastasize to the regional lymph nodes (0.01%–0.50% of cases), although locally advanced lesions can invade nearby structures and cause symptoms such as numbness, pain, and weakness.[7-9] In general, BCC has a slow rate of annual

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growth (≤ 5 m) and, compared with SCC, has a higher cure rate following local management.[7,10]

SCC arises from epithelial keratinocytes and tends to progress over decades of exposure to the sun from precursor lesions known as actinic keratoses, which are typically small, red, scaly, 1- to 3-mm papules with a rough texture.[7,11] Compared with BCC, SCC has a higher risk of local recurrence (8%–15% of cases) and distant metastasis (0.5%–16.0% of cases).[9,12-14] The risk of recurrence or metastasis with BCC and SCC depends on multiple risk factors.

Risk Factors for Recurrence

High-risk factors for locoregional recurrence and distant metastases following definitive therapy of BCC and SCC are important prognostic information and central for appropriate management recommendations. Most risk factors have been identified based on retrospective studies and, thus, lack prospective validation.[15] Risk factors identified for BCC recurrence include tumor size (> 2 cm), tumors located in the "H zone" of the face (representing embryonic fusion planes and includes portions of the nose, scalp, ears, and lips), recurrent tumors, perineural invasion, poorly defined borders, and more aggressive histologies (infiltrative, morpheaform, or basosquamous histology).[7,16,17]

Because of the compact and complex neurovascular anatomy of the head and neck, as well as the functional and cosmetic importance of the head and neck region, wide surgical margins are often difficult to attain and therefore represent a higher risk factor for recurrence than other sites of the body.

Similarly, high-risk factors for cutaneous SCC include tumor locations at specific sites of the head and neck, including the lip or ear, tumors arising from a scar, recurrent tumors, large tumor size (> 2 cm), tumor depth of more than 4 mm or Clark level of at least IV, invasion beyond the subcutaneous tissue, rapidly growing lesions, perineural invasion, desmoplasia, poor differentiation, or infiltrative margins.[18-22] Among patients who underwent resection, positive margins have also been reported as prognostic.[23,24] Of note, clinically evident perineural invasion with BCC or SCC has been shown to carry a higher risk of recurrence than incidental perineural invasion found on pathology.[25,26] SCC with perineural invasion also carries a higher incidence of lymph-node metastasis.[27]

The American Joint Commission on Cancer has taken many of these risk factors into account in its combined staging system of BCC and SCC, defining factors such as Breslow thickness (> 2 mm), Clark level (≥ IV), perineural invasion, primary tumor locations of the ear or hair-bearing lips, and poorly differentiated or undifferentiated tumors as being high risk.[17] Given that prospective validation of these risk factors is lacking, factors considered to be high risk by the American Joint Commission on Cancer are primarily based on consensus opinion; thus, in response, new staging schema have been proposed.[15,20,28]

Radiotherapy

Radiotherapy (RT) plays an integral role in the treatment of cutaneous BCC and SCC of the head and neck and can be used in the definitive setting, adjuvant setting, or both. Patient selection for RT is important and best determined in the setting of multidisciplinary care. Lesions in cosmetically sensitive areas (eyelids, nasal skin, central face, contour of the ear) are often best managed with RT. The Fig shows 2 examples of large-sized SCCs on the face before and after treatment with definitive RT. Similarly, RT allows for functional preservation of organs, eyelids, nasal folds, ears, nose, and lips, whereas surgery could lead to functional impairment.

Many retrospective studies have addressed the use of definitive RT for epithelial skin cancers of the head and neck (Table).[9,10,29-49] Local control rates with definitive radiation are generally considered to be excellent, but they vary based on the proportion of BCC and SCC and recurrent tumors.[9,10,29-49]

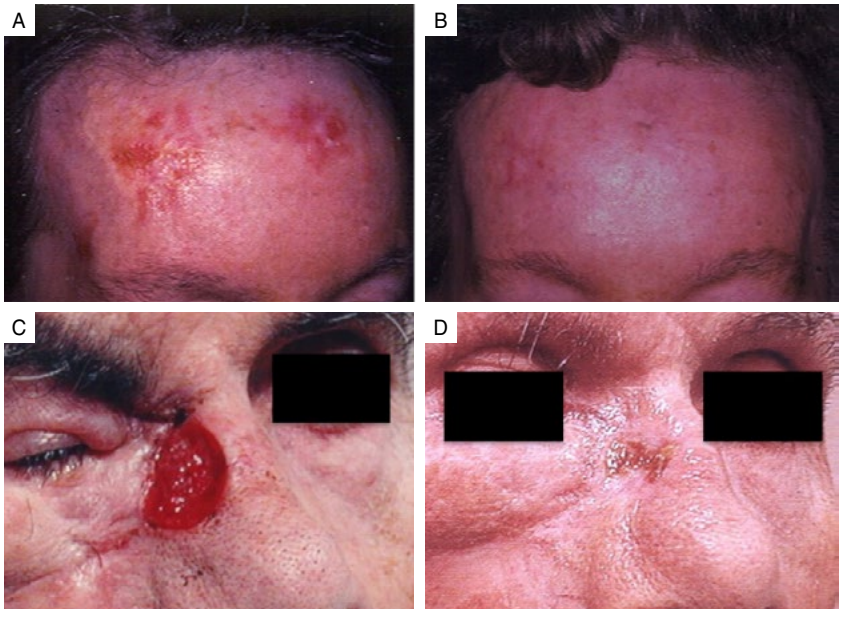

Fig A–D. — A multifocal recurrence of SCC of the skin of the forehead (A) before and (B) after definitive radiotherapy. A separate patient with ulcerative SCC involving the nose and right medial canthus (C) before and (D) after definitive radiotherapy. SCC = squamous cell carcinoma.

Table. — Select Studies of Definitive Radiotherapy for Cutaneous BCC and SCC of the Head and Neck

Study	No. of Study Patients	Lesions, n (%)	BCC Lesions, n (%)	SCC Lesions, n (%)	T4 Lesions, n (%)	Recurrent Lesions, n (%)	Follow-Up, y	Overall Local Control Rate, %	BCC Local Control Rate, %	SCC Local Control Rate, %	Cosmesis (Good/ Excellent), %	Grade ≥ 4 Late Toxicity, %
Head and Neck												
Abbatucci[39]	675	675 (100)	Unknown	Unknown	Unknown	Unknown	2.0	> 96.0 (crude)	Unknown	Unknown	48.0	Unknown
Al-Othman[38]	85	88 (100)	41 (46.6)	37 (42.0)	88 (100)	45 (51.1)	4.0	53 (5-y actuarial)	Unknown	Unknown	Unknown	Unknown
Avril[29,a]	173	173 (100)	173 (100)	0 (0)	0 (0)	0 (0)	4.0	92.5 (4-yr actuarial)	92.5 (4-y actuarial)	—	69.0	Unknown
Cognetta[36]	854	854 (100)	712 (83.4)	133 (15.6)	0 (0)	Unknown	2.6	97.0 (crude)	95.8 (5-y actuarial)	93.3 (5-yr actuarial)	Unknown	Unknown
Olschewski[37]	85	104 (100)	104 (100)	0 (0)	Unknown	Unknown	3.1	100 (crude)	100 (crude)	—	94.0	Unknown
Petrovich[32]	646	646 (100)	465 (72.0)	116 (18.0)	Unknown	Unknown	5.0	90.7 (crude)	Unknown	Unknown	Unknown	Unknown
Nasal Skin												
Caccialanza[40]	620	671 (100)	656 (97.8)	15 (2.2)	2 (0.3)	89 (13.3)	3.2	94.3 (crude)	93.3 (crude)	94.4 (crude)	74.5	Unknown
Childers[41]	26	26 (100)	26 (100)	0 (0)	Unknown	5.0 (19.0)	9.3	96.0 (crude)	96.0 (crude)	—	81.0	0
Tsao[33]	94	94 (100)	0 (0)	94 (100)	7 (7.4)	Unknown	2.9	85.0 (5-y actuarial)	—	85.0 (5-y actuarial)	Unknown	0
Eyelid and Medial Canthus												
Fitzpatrick[45] (eyelid)	1,166	1,166 (100)	1,062 (91.1)	104 (8.9)	14 (1.2)	418 (35.8)	5.0	94.9 (5-y crude)	95.0 (5-y crude)	93.0 (5-y crude)	Unknown	Unknown
Krema[42] (medial canthus)	90	90 (100)	90 (100)	0 (0)	Unknown	26 (28.0)	6.7	94.0 (10-y actuarial)	94.0 (10-y actuarial)	—	Unknown	Unknown
Rodriguez-Sains[44] (eyelid)	631	631 (100)	631 (100)	0 (0)	Unknown	~ 315 (50.0)	6.1	95.8 (crude)	95.8 (crude)	—	Unknown	Unknown
Swanson[43] (medial canthus)	23	23 (100)	23 (100)	0 (0)	0 (0)	6 (26.0)	9.9	87.0 (crude)	87.0 (crude)	—	Unknown	0
Pinna												
Caccialanza[46]	108	115 (100)	99 (86.1)	16 (13.9)	Unknown	Unknown	2.4	89.6 (crude)	87.9 (actuarial)	100 (crude)	74.8	Unknown
Silva[30]	313	334 (100)	201 (60.2)	122 (36.5)	44 (13.2)	50 (15.0)	3.3	86.6 (2-y actuarial)	93.0 (2-y actuarial)	82.0 (2-y actuarial)	Unknown	5.7
Multiple Sites												
Barysch[47]	179	156 (86.7)	0 (0)	180 (100)	Unknown	3 (1.7)	4.9	86.7 (crude)	—	86.7 (crude)	Unknown	Unknown
Griep[34]	389	370 (95.0)	295 (75.8)	94 (24.2)	Unknown	75 (19.3)	2.0	95.1 (crude)	95.9 (crude)	92.5 (crude)	73.1	Unknown
Locke[31]	468	491 (92.5)	389 (73.3)	142 (26.7)	31 (5.8)	167 (31.5)	5.8	88.7 (crude)	92.0 (crude)	79.6 (crude)	92.0	Unknown
Lovett[9]	339	319 (94.1)	242 (71.4)	92 (27.1)	Unknown	137 (37.5)	2.0 (minimum; median not reported)	86.1 (crude)	90.9 (crude)	75.3 (crude)	91.6	Unknown
Kwan[10]	182	163 (89.6)	61 (33.5)	121 (66.5)	29 (15.9)	98 (53.8)	3.5	70.3 (crude)	86.0 (4-y actuarial)	58 (4-y actuarial)	Unknown	Unknown
van Hezewijk[48]	333	355 (81.8)	332 (76.5)	102 (23.5)	0 (0)	0 (0)	3.6	97.5 (crude)	97.0 (crude)	95.1 (crude)	Unknown	Unknown
Zagrodnik[49]	148	135 (77.1)	175 (100)	0 (0)	Unknown	0 (0)	4.0	84.2 (5-y actuarial)	84.2 (5-y actuarial)	—	Unknown	Unknown

[a]Prospective trial.
BCC = basal cell carcinoma, SCC = squamous cell carcinoma.

A dermatological surgeon and radiation oncologist should closely collaborate with each other as well as with the patient to devise an appropriate treatment plan. Balancing time, cosmetic and functional outcomes, and cost should all factor into the treatment decision. RT is typically delivered during several weeks, possibly creating logistical issues with patients, whereas extensive surgery with reconstruction can extend treatment and healing time. For patients taking anticoagulant medication, RT offers the safest option, because it does not require patients to interrupt their anticoagulants prior to surgery. Other issues to consider when discussing surgery and RT include patient age, treatment preference, and treatment availability.[50] Clinical practice guidelines from the National Comprehensive Cancer Network recommend that definitive RT be offered to nonsurgical candidates; they also state that radiation is often reserved for patients 60 years or older because of concern for long-term sequellae.[51,52]

A trial that began enrolling patients in 1982 is the only trial ever completed that compared surgery with RT for the definitive treatment of BCC.[29] Avril et al[29] randomized 347 patients with BCC of the face (tumor size < 4 cm) to surgery (n = 174 [≤ 2-mm margin]) or RT (n = 173; 55% interstitial brachytherapy, 33% contact therapy, 12% conventional therapy). The study reported an actuarial 4-year local control rate of 99.3% with surgery compared with 92.5% for RT (P = .003).[29] At 3 months, patient-reported cosmesis was equivalent in the 2 groups; by 4 years, 87% of participants in the surgical arm reported having a good cosmetic outcome compared with 69% of those in the RT arm (P = .05).[29] However, the trial took place prior to the availability of 3-dimensional treatment planning and, as such, adequate tumor volume coverage and radiation dosimetry to prevent extreme radiation hot-spots would have been difficult, particularly for deeper tumors. This could have been what led to worse cosmetic outcomes. The recurrence rates and cosmetic outcomes were also not reported by the respective method of radiation delivery — information that could have been useful to clarify the outcomes and cosmetic results.[29] Interstitial iridium-192 brachytherapy was delivered to 55% of study volunteers, thus causing a heterogeneous radiation dose distribution: high radiation doses near the catheters and, theoretically, a higher risk for skin toxicity and fibrosis.[29]

A French retrospective series reported acceptable rates of toxicity with interstitial brachytherapy for the treatment of cutaneous carcinomas, but the researchers also reported a lower rate of cosmetic toxicity when using a dose rate of less than 98 cGy/hour[53]; the dose rate in the trial by Avril et al[29] was not reported. The trial also allowed superficial, orthovoltage contact therapy (50 kV) with a hypofractionated radiation dose schedule of 2 sessions of 18 to 20 Gy separated by 2 weeks (33% of study patients).[53] This high-dose, hypofractionated radiation schedule is associated with worse cosmetic outcomes.[30,31,54] By contrast, cosmetic outcomes are generally good or excellent and rates of toxicities related to radiation are rare with modern radiation techniques and more protracted fractionation schema when properly performed (see Table[9,10,29-49]).

Adjuvant Therapy

Following the wide excision of BCC and SCC, the goal of postoperative RT is to further minimize the risk of local or regional recurrence. In general, adjuvant RT is appropriate when either the risk of recurrence is high or the probability of successful salvage surgery is relatively low.[50] Adjuvant RT is often recommended after wide excision with close or positive margins or when other high-risk factors are present, including perineural invasion, invasion of the bone or nerves, or recurrent disease.[50]

Management of regional lymphatics, including clinically or radiographically positive lymph nodes, typically consists of nodal dissection and adjuvant RT. No prospective trials have evaluated adjuvant regional RT for cutaneous BCC or SCC, although some retrospective series have reported improved rates of locoregional control with use of adjuvant RT.[55-58]

For patients with mucosal SCC of the head and neck, 2 large prospective trials have assessed the utility of chemoradiotherapy compared with RT alone.[59,60] A combined analysis of both trials found a significant improvement in rate of survival for study patients with positive surgical margins or extracapsular extension who were treated with adjuvant chemoradiotherapy.[61] Prospective trials with adjuvant locoregional chemoradiotherapy for cutaneous BCC and SCC are also lacking. However, the results of adjuvant chemoradiotherapy for mucosal SCC are often extrapolated and applied to cutaneous SCC, and chemoradiotherapy is often recommended in patients with positive margins or extracapsular extension.

A retrospective analysis of 61 patients with American Joint Commission on Cancer stage III/IV SCC of the skin and at least 1 risk factor, including at least 2 lymph nodes, close (< 1 mm) or positive surgical margins, or extracapsular nodal extension, found a significantly improved rate of median recurrence-free survival with adjuvant chemoradiotherapy compared with adjuvant RT alone (40.3 vs 15.4 months, respectively).[62] An ongoing prospective phase 3 trial is also evaluating the potential benefit of concurrent carboplatin with RT compared with RT alone in individuals with high-risk postoperative cutaneous SCC of the neck (NCT00193895). The trial is expected to close at the end of 2016, and its results may help guide treatment decisions with concurrent adjuvant systemic therapy.

Dosing Schedule

Various radiation dose and fractionation schedules have been used for both the definitive and adjuvant treatment of BCC and SCC. Few retrospective series have shown improved rates of local tumor control for epithelial skin cancers with increasing the biologically effective dose, increasing the daily fraction size, and/or increasing the total dose of radiation.[31,32,54] For definitive treatment, radiation doses higher than 5 Gy, typically delivered every other day or twice per week, have been shown to offer equivalent rates of local control at the cost of increased toxicity and, often, poor cosmesis.[31,32,54]

Because of these increased rates of toxicity, daily radiation doses higher than 5 Gy are typically reserved for patients who are frail and unable to make daily office visits. By contrast, radiation schedules using lower daily radiation doses between 2 and 5 Gy (ie, 3 Gy daily fractions for a total dose of 51–54 Gy or 2.5 Gy daily fractions for a total dose of 50–60 Gy) are commonly used due to their favorable toxicity and cosmetic profiles.[30-34]

For lesions involving bone or cartilaginous tissues or for very large tumors, conventional daily radiation doses of 2 Gy are often used, with total doses ranging from 66 to 76 Gy.[34] In general, fraction sizes of less than 4 Gy offer optimal cosmesis and fraction sizes of less than 3 Gy should be considered if bone or cartilage is present in the treatment field.[7] In our experience, abbreviated schedules, such as 51 Gy in 17 fractions of 3 Gy per fraction, produce an excellent balance of cosmetic outcomes and time sensitivity.

Technique

Many RT techniques have been used for the treatment of epithelial skin cancers. The appropriate radiation technique depends on multiple factors, including primary tumor location, tumor size, scar length (in the postoperative setting), neighboring anatomy, and whether the regional lymph nodes are included.

Many options are also available for the treatment of cutaneous cancers. Superficial megavoltage electrons are typically used for primary lesions or tumor beds 5 mm or deeper. Electrons are produced from linear accelerators and have a dose distribution, with the peak dose near the skin surface and a rapid dose fall-off beyond the target.[7] Superficial orthovoltage x-rays, or photons, have also traditionally been used to treat cutaneous BCC and SCC and provide less of a penumbra (the distance from the area receiving 20% and 90% of the dose) surrounding the radiation target than electrons. Superficial kV x-rays also have a peak dose near the skin surface, do not require a bolus, and work well on irregular surfaces without having to create a smooth, tissue-equivalent bolus, as is necessary with electrons. Despite this, superficial kV x-rays are limited to use with superficial tumors and, as a result, are not frequently used.[7]

For the treatment of larger and more complex tumors and postoperative tumor beds, treatment with megavoltage photons using either 3-dimensional conformal or intensity-modulated RT may be appropriate. Intensity-modulated RT can be advantageous for larger cutaneous head and neck tumors because of its ability to limit radiation to nearby critical structures, including the parotid and submandibular glands, and it has been shown to improve quality of life.[63]

Select retrospective, single-institution comparisons of electrons and superficial photons have found no difference in outcomes. Locke et al[31] reviewed and compared outcomes of 531 patients with BCC and SCC who were treated with superficial electrons (19%), superficial kV photons (60%), or a combination of both (20%); they found no difference in rates of local recurrence. Similarly, Griep et al[34] assessed outcomes of 389 patients with BCC and SCC who were treated with superficial photons or electrons, and they too reported no difference in local recurrence by treatment technique; however, they did report improved cosmetic outcomes with smaller daily doses of radiation (3 Gy daily fractions) compared with larger daily doses (6–10 Gy daily fractions). Because recurrence is similar between techniques, the appropriate technique should instead be based on factors such as tumor size, depth, location, and field size.

Cutaneous Brachytherapy

Brachytherapy is frequently used for superficial (< 1 cm depth) skin cancers. High-dose-rate brachytherapy can incorporate 3-dimensional dosimetric planning, and it can be used with surface applicators or molds that conform to the contours of a patient's skin. For smaller tumors of the skin (size < 3 cm, depth ≤ 5-mm), a Leipzig applicator (Nucletron, Veenendaal, The Netherlands) or Valencia applicator (Nucletron) can be used. For more extensive skin lesions (surface depth < 1 cm), a Freiburg Flap applicator (Elekta, Stockholm, Sweden) or HAM applicator (Mick) is often used.[64] Guix et al[65] reported on 102 facial cases of BCC and 34 cases of SCC definitively treated using high-dose-rate brachytherapy with iridium-192 and surface molds. Gross tumors were treated with a minimum dose of 6000 to 6500 cGy in 180 cGy daily fractions calculated at a 5-mm depth.[65] The group reported a 5-year actuarial local control rate of 98% for all tumors and local control rates of 99% for primary tumors and 87% for recurrent tumors.[65] No severe early or late complications were reported.

Systemic Approaches to Aggressive Cutaneous Malignancies

In an attempt to improve rates of locoregional control

for high-risk skin carcinomas, systemic therapy with or without concurrent RT has been investigated. The literature addressing systemic chemotherapy for cutaneous BCC and SCC is generally limited to small retrospective series and case reports.[56-68] Substantial improvements have been made in our understanding of the molecular changes present in BCC and SCC. For example, the sonic hedgehog signaling pathway has been shown to play a key role in the development of most cases of BCC, so it is being investigated as a therapeutic target.[3,69,70] The efficacy and safety of vismodegib, a sonic hedgehog inhibitor, was first investigated by Raleigh et al,[71] and then was tested in patients with metastatic (n = 33) or locally advanced (n = 71) BCC that recurred following surgery and in those who were not candidates for surgery or RT.[72] Results of the trial were promising. Among the study patients with metastatic and locally advanced tumors, objective response rates of 33.3% and 47.6%, respectively, were seen by independent review, as were median duration of responses of 7.6 and 9.5 months, respectively.[72]

A second larger trial addressed rates of response and toxicity of vismodegib among a similar group of patients with metastatic (n = 31) or locally advanced (n = 468) BCC who were not surgical candidates.[73] The results were promising, with overall and complete response rates by investigator review of 66.7% and 33.8%, respectively, among patients with locally advanced disease.[73] The rate of median duration of response was 22.7 months among study patients with locally advanced and metastatic disease.[73] Nearly all study participants experienced toxicities (98.0%), although grade 5 toxicities were relatively rare, occurring in 21 (5.0%).[73]

Another sonic hedgehog inhibitor, sonidegib, was tested in a randomized phase 2 trial at 2 different dose levels (200 and 800 mg) in a similar setting with both locally advanced and metastatic BCC.[60] At a median follow-up of nearly 14 months, 43% and 15% of study patients with locally advanced and metastatic BCC, respectively, had an objective response at the 200-mg dose level; similar response rates were seen in the higher dose group but at the expense of increased adverse events.[60]

Preliminary case reports of concurrent treatment with RT and vismodegib have been reported with promising results.[75] A phase 2 trial is also underway to test the safety and tolerability of vismodegib combined with RT for locally advanced BCC (NCT01835626). The results of this trial will help guide future trials and treatment decisions with respect to combined modality treatment for BCC.

Similar to mucosal SCC of the head and neck, cutaneous SCC also frequently overexpresses epidermal growth factor receptor.[76] Cetuximab has been shown to prolong survival in patients with untreated recurrent and metastatic mucosal SCC of the head and neck when cetuximab is combined with fluorouracil/platinum compared with fluorouracil/platinum alone.[77] Adding cetuximab to RT has also been shown to improve rates of survival for patients with locally advanced mucosal SCC of the head and neck compared with RT alone.[78] Despite this, the data addressing cetuximab use in patients with cutaneous SCC are in their infancy and largely consist of cases reports.[79,80] A pilot study reported on the use of cetuximab in 20 patients with inoperable cutaneous SCC.[81] Overall, 47% of study patients had a response; 33% with cetuximab alone (n = 6), 80% with cetuximab and RT (n = 5), and 38% with carboplatin (n = 9).[81]

Two additional epidermal growth factor receptor tyrosine kinase inhibitors, erlotinib and gefitinib, have been assessed in phase 1 and 2 studies, respectively, with concurrent RT for cutaneous SCC.[35,82] In the phase 1 trial, erlotinib was concurrently delivered with RT in 15 patients with locally advanced cutaneous SCC (93% with T4 disease).[82] The combination therapy resulted in a grade 2/3 skin reaction in 100% of the study volunteers, mucositis in 87%, and diarrhea in 20%; the researchers concluded that the combination therapy had an acceptable toxicity profile.[82] Gefitinib was studied in a phase 2 trial in which it was first delivered neoadjuvantly and study participants were assessed for response.[35] Those who responded were then treated with definitive local therapy followed by maintenance gefitinib. Among 22 study patients evaluable for response, 18% achieved a complete response and 27% had a partial response; 59% experienced adverse effects from the neoadjuvant therapy.[35] Following induction, 12% were treated with surgery, 18% with RT alone, 12% with concurrent gefitinib and RT, and 47% with surgery and postoperative RT and concurrent gefitinib.[35] The outcomes were promising: The 2-year disease-specific and progression-free survival rates were 72% and 64%, respectively.[35]

However, further studies addressing the use of epidermal growth factor receptor inhibitors alone and concurrently with RT for cutaneous SCC are needed.

Conclusions

Radiotherapy (RT) plays an integral role in the treatment of primary and postoperative cutaneous basal cell and squamous cell carcinomas of the head and neck. In general, definitive RT is recommended for tumors located in cosmetically or functionally sensitive areas of the face, for patients who cannot tolerate anesthesia and, often, for those who are taking anticoagulants, or for patients who prefer RT to other treatment modalities. A wide range of radiation doses, daily fractionation schedules, and radiation techniques are effective for basal and squamous skin cancers, and recommendations should take into account

the size, depth, location, field size, and neighboring anatomy of the tumor.

In general, adjuvant local RT is recommended following excision for patients with high-risk factors, including those with close or positive tumoral margins, perineural invasion, invasion of the bone or nerves, or recurrent disease. Adding concurrent chemotherapy to adjuvant RT can be considered for patients at higher risk, including those with positive tumoral margins or nodal extracapsular extension. Prospective trials are currently underway to address the role of concurrent systemic therapy and RT for both cutaneous basal cell and squamous cell carcinomas.

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