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Treatment and Outcomes for Cutaneous Periauricular Basal Cell Carcinoma: A 16-Year Institutional Experience

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Abstract

Objective. To report a single institutional experience with the surgical management of cutaneous periauricular basal cell carcinoma.

Study Design. Retrospective chart review.

Setting. Tertiary academic center.

Methods. Retrospective chart review of 71 patients diagnosed with periauricular basal cell carcinoma managed surgically from 2000 to 2016. Data were analyzed with descriptive statistics.

Results. The median age at diagnosis was 73.0 years (interquartile range, 13.0). Of all lesions, 2.8% (n = 2) were preauricular, 80.3% (n = 57) auricular, and 16.9% (n=12) postauricular. Auricular subsites included conchal bowl (36.6%, n = 26), helix (21.1%, n = 15), antihelix (1.4%, n = 1), peritragus (5.6%, n = 4), triangular fossa (1.4%, n = 1), external auditory canal (2.8%, n = 2), and lobule skin (1.4%, n = 1). Surgical approach included wide local excision (80.3%, n = 57), partial auriculectomy (8.5%, n = 6), and total auriculectomy or other combinations of surgical methods (11.3%, n = 8). Due to aggressive pathology, 3 cases required concurrent parotidectomy, neck dissection, ear canal sleeve resection, or mastoidectomy. In sum, 52.1% (n = 37) of cases had clear margins on first pass in the operating room; 25.4% (n = 18) required further resection; and 12.7% (n = 9) demonstrated final positive/overturned margins read as negative from the frozen sections. Reconstruction included full-thickness (25.4%, n = 18) or superficial-thickness (29.6%, n = 21) skin grafts and local flap reconstruction (25.4%, n = 18), while 5.6% (n = 4) required combinations of free flap and/or other reconstruction techniques; 14.1% (n = 10) did not undergo formal reconstruction.

Conclusion. Periauricular basal cell carcinoma occurs in anatomically diverse locations in and around the ear, and multiple surgical methods are required for successful treatment.

Keywords

cutaneous malignancy, basal cell carcinoma, periauricular, preauricular, postauricular

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Basal cell carcinoma (BCC) is the most common cutaneous malignancy; the majority of lesions occur on the face.[1] Primary risk factors for BCC include advanced age, male sex, prolonged ultraviolet (UV) light exposure, and Northern European (fair complexion) descent.[1,2] Additional risk factors include a history of increased intermittent UV light exposure or blistering sunburns in childhood, exposure to ionizing radiation, HIV seropositivity, immunosuppression, and existing genetic predisposition.[2] Incidence of BCC is rising approximately 2% per year, including significant increases in women and individuals aged <40 years.[3]

National Comprehensive Cancer Network guidelines are frequently referenced in cutaneous BCC management.[4] Lesions are best managed surgically, although the recommended method differs according to risk of recurrence or metastasis.[4] Recurrence rates are lower following surgical

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excision and Mohs microsurgery (MMS) as compared with nonsurgical modalities, including topical therapy, curettage and electrodessication, cryotherapy, and radiation, as well as destructive modalities.[5] Standard excision with a 4-mm margin of uninvolved skin and/or biopsy to a depth of the midsubcutaneous adipose tissue with histologic margin assessment is recommended for low-risk lesions.[5] Facial lesions involving the H-area—including the central face, eyelids, eyebrows, periorbital skin, nose, lips, chin, mandible, pre- and postauricular skin/sulci, temple, and ear proper—are implicated to be high risk for recurrence and require surgery with recommended 5- to 6-mm margins or MMS.[4,6] Surgical excision is typically followed by primary closure or reconstruction with local tissue flaps, skin grafts, or healing by secondary intention.[1]

While MMS is typically recommended for high-risk BCC, select tumors may be managed with standard excision with complete margin assessment.[5] The highest rates of incomplete excision involve the ears, nose, and periocular region.[6] Additionally, BCC of the head and neck has a higher relative tumor density than the rest of the body, indicating a higher tumor burden as compared with relative surface area.[7] Given the higher cure rates of primary BCC and the tendency for recurrent lesions to be more aggressive, it is essential to obtain negative margins with removal of primary lesions.[6] The increased risk of recurrence of auricular and periauricular lesions, combined with the challenge of obtaining an optimal cosmetic outcome while obtaining negative margins, necessitates surgical expertise in these complex regions. While the majority of nonmelanoma cutaneous cancers (NMCCs) are treated by dermatologists with MMS, alternative consultation for conventional excision may occur as a result of tumor location or extension (often to the external auditory canal), size, and general low risk of metastasis of select BCC lesions.[8] These considerations may require surgical extent/techniques not garnered by dermatology based on complex anatomic locations. Some patients may be referred for management by otolaryngologists based on particular lesion characteristics, and we seek to detail the comprehensive surgical experience for these individuals treated at a tertiary referral center.

Materials and Methods

Data Source and Study Population

Following approval by the University of Michigan Institutional Review Board (HUM00115814), a retrospective medical record review was conducted of all patients diagnosed with NMCC of the head and neck and treated at our institution from 2000 to 2016. DataDirect[9] and EMERSE[10] search functions were utilized to identify patients for inclusion in the study. A total of 71 patients were identified as meeting inclusion criteria of cutaneous BCC of the auricular or periauricular region, defined as biopsy-proven lesions of the external auditory canal (EAC), auricle, or immediate pre- or postauricular region. Patients surgically treated by outside otolaryngology or dermatology physicians were excluded. Only patients treated surgically at our institution by otologic surgeons within the Department of Otolaryngology–Head and Neck Surgery were included.

Table 1. Demographics and Tumor Characteristics for Patients With Periauricular Basal Cell Carcinoma (N = 71).

Characteristic	No. (%)
Sex	
Male	51 (71.8)
Female	20 (28.2)
Ethnicity	
White	69 (97.2)
Not reported	2 (2.8)
Tobacco use	
Current	10 (14.1)
Former	22 (31.0)
Never	39 (54.9)
Comorbidities	
Diabetes	11 (15.5)
Immunosuppression	2 (2.8)
Transplant history	1 (1.4)
History of sun exposure	
Yes	62 (87.3)
No	1 (1.4)
Not reported	8 (11.3)
History of NMCC at other sites	
Yes	46 (64.8)
No	24 (33.8)
Not reported	1 (1.4)

Abbreviation: NMCC, nonmelanoma cutaneous cancer.

Measures and Statistical Analysis

Comprehensive data were collected on patient demographics, tumor characteristics (detailed anatomic location/subsite and size), radiographic (where indicated) and pathologic findings, treatment rendered (surgery with or without radiation and/or chemotherapy), reported intraoperative frozen section/margin clearance, final permanent surgical pathology, clinical follow-up, and rates of recurrence. Descriptive statistics and inferential statistics, including Student's t test (2-tailed, $\alpha = 0.05$), were performed with SPSS version 26.0 (IBM).

Results

Patient Demographics

Among our study population, 71 patients met inclusion criteria for BCC of the auricular and periauricular regions. The median age at diagnosis was 73.0 years (interquartile range, 13.0). The majority of patients were male (71.8%, n = 51) and Caucasian (97.2%, n = 69). Underlying risk factors included smoking (14.1% current, n = 10; 31.0% former, n = 22; 54.9% never, n = 39) and significant history of UV light exposure (87.3%, n = 62; **Table 1**). Additional comorbidities include diabetes (15.5%, n = 11), immunosuppression (2.8%, n = 2), and solid organ transplant history

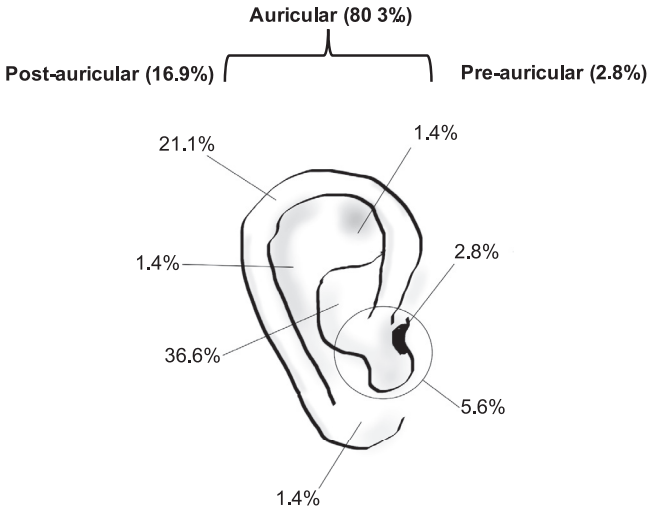

Figure 1. External ear subsite distribution. Peritragal region (5.6%) includes tragus, antitragus, retrotragal, and intertragal sites.

(1.4%, n = 1). The majority of patients (64.8%, n = 46) had a known history of NMCC at other nonauricular or periauricular anatomic skin sites. No patients reported any associated disease states commensurate with cutaneous BCC genesis, including Gorlin's syndrome.

Tumor Characteristics

Tumor location was distributed among preauricular (2.8%, n = 2), auricular (80.3%, n = 57), and postauricular (16.9%, n = 12) sites (**Figure 1**). Among auricular lesions, specific subsites on the external ear included conchal bowl (36.6%, n = 26), helix (21.1%, n = 15), antihelix (1.4%, n = 1), peritragus (5.6%, n = 4), triangular fossa (1.4%), EAC (2.8%, n = 2), and lobule skin (1.4%, n = 1). Two lesions (2.8%) extended into multiple auricular subsites (ie, EAC and conchal bowl, antihelix, and triangular fossa). Subsite was unspecified in 7.0% (n = 5) of tumors (**Table 2**). Recorded tumor size at the largest dimension ranged from 0.40 to 7.0 cm.

Treatment of Primary Tumors

Surgical Modality. Most tumors were treated exclusively in the operating theater with wide local excision (WLE; 80.3%, n = 57), while others required full-thickness resection in the form of, partial or subtotal auriculectomy, or a combination of surgical modalities. Essentially a WLE and partial auriculectomy are synonymous. However, the resection could be either split thickness or full thickness. Split-thickness resections typically involve removing the anterior or posterior skin of the auricle, according to tumor location and underlying auricle cartilage, with a 0.5-cm margin but with the opposite skin margin intact for reconstruction (ie, posterior skin is left for an anterior tumor and vice versa). Conversely, full-thickness resection WLE/auriculectomy removes anterior and posterior auricular skin and the intervening auricular cartilage. This resection, after clearing the resection edge with frozen margins, is typically closed primarily with no need for a skin graft reconstruction. Additional surgical resection performed at the time of the WLE included superficial parotidectomy (4.2%, n = 3), lateral temporal bone resection and/or mastoid periosteum removal (2.8%, n = 2), and EAC skin sleeve resection (2.8%, n = 2). All surgical cases with additional procedures performed beyond WLE are reported in **Table 3**. One case, involving extensive tumor burden and aggressive histologic features on biopsy, required a total auriculectomy with concurrent EAC sleeve resection and split-thickness skin grafting, intact canal wall mastoidectomy, superficial parotidectomy, and selective neck dissection of level II-III. In a separate case, local excision of positive deep margins was required following MMS.

Margins. Among tumors treated with WLE, the majority (52.1%, n = 37) had initial clear margins (ICMs) on the first set of frozen margins sent immediately after the primary tumor was resected in the operating room. Other cases

Table 2. Tumor Location and Histopathologic Features.

Characteristic	No. (%)
Age at initial diagnosis, y	73.0 [13.0][a]
Initial site	
Preauricular	2 (2.8)
Postauricular	12 (16.9)
Auricular	57 (80.3)
Auricular subsite (n = 57 tumors)	
Peritragal (tragus, antitragus, retrotragal, intertragal)	4 (5.6)
Helix	15 (21.1)
Antihelix	1 (1.4)
Conchal bowl	26 (36.6)
Lobule	1 (1.4)
External auditory canal	2 (2.8)
Intra-auricular with extension	2 (2.8)
Triangular fossa	1 (1.4)
External ear, unspecified	5 (7.0)
Tumor characteristics	
Aggressive histologic subtypes (n = 58)	
Aggressive growth pattern, unspecified	24 (33.8)
Basosquamous	3 (4.2)
Micronodular	7 (9.9)
Infiltrative	8 (11.3)
Metatypical	1 (1.4)
Locally invasive	3 (4.2)
Ulceration	5 (7.0)
Multifocal	1 (1.4)
Mixed (aggressive and nonaggressive features)	6 (8.5)
Nonaggressive histologic subtypes (n = 11)	
Circumscribed growth pattern	3 (4.2)
Nodular growth pattern	4 (5.6)
Superficial/superficial and circumscribed	4 (5.6)
Unspecified	2 (2.8)

[a]Median [interquartile range].

Table 3. Treatment Modalities for Primary Tumors.[a]

Treatment	No. (%)
Surgical modality	
Left total auriculectomy, radical excision of preauricular skin, superficial parotidectomy, level II neck dissection, lateral temporal bone resection	1 (1.4)
Mohs excision with excision of auricular cartilage for deep margin	1 (1.4)
Right radical excision of left ear lobe, conchal cartilage, and tail of parotid gland	1 (1.4)
Right radical auriculectomy, radical excision of EAC lesion, mastoidectomy, superficial parotidectomy, right selective neck dissection (II-III)	1 (1.4)
Subtotal auriculectomy with partial sleeve resection of EAC	1 (1.4)
WLE of postauricular BCC with excision of underlying cartilage and temporal bone periosteum	1 (1.4)
WLE right conchal bowl with right lateral EAC sleeve resection	1 (1.4)
Not reported	1 (1.4)
Subtotal auriculectomy	6 (8.5)
WLE	57 (80.3)
Preoperative imaging	
Magnetic resonance imaging	2 (2.8)
Computed tomography	9 (12.7)
Adjuvant treatment: radiation	1 (1.4)
Reconstruction	
Local flap	18 (25.4)
FTSG	18 (25.4)
STSG	21 (29.6)
Multiple modalities (FTSG, STSG, cartilage graft, radial free flap, etc)	3 (4.2)
No reconstruction	10 (14.1)
Not reported	1 (1.4)
Recurrence	
Observed	8 (11.3)
Not observed	61 (85.9)
Not reported	2 (2.8)

Abbreviations: BCC, basal cell carcinoma; EAC, external auditory canal; FTSG, full-thickness skin graft; STSG, superficial-thickness skin graft; WLE, wide local excision.

[a]Most lesions were treated with WLE exclusively. Some cases required 1 or multiple additional dissections.

(25.4%, n = 18) had involved frozen margins (IFMs) requiring further resection (multiple frozen sections) before leaving the operating room, with eventually cleared margins on intraoperative frozen sections. A number of tumors (12.7%, n = 9) demonstrated positive/overturned surgical margins (POMs) on final pathology that were read as negative for carcinoma on the intraoperative frozen sections. These cases were managed with either additional procedures (ie, MMS; n = 2) or clinical surveillance (n = 7) in accordance with patient preferences and surgeon recommendations. In both cases with elective re-excision, clear margins were obtained after additional resection. Margin data were unlisted in 6 cases (8.5%).

Auricular lesions with the highest rates of ICMs demonstrated by intraoperative frozen margins included lesions of the helix (66.7%, n = 10) and conchal bowl (46.2%, n = 12). One of 2 preauricular lesions and 58.3% (n = 7) of postauricular lesions had ICMs. POMs had a frequency of 26.7% (n = 4) among lesions of the helix and 16.7% (n = 2) of postauricular lesions (**Table 4**). Conchal bowl lesions had the highest rate of IFMs requiring additional resection (46.2%, n = 2).

Histopathologic Findings. Out of 71 tumors, 58 (81.7%) demonstrated histopathologic findings associated with an aggressive growth pattern, including but not limited to infiltrative (n = 8, 11.3%), micronodular (n = 7, 9.9%), basosquamous (n = 3, 4.2%), and metatypical (n = 1, 1.4%; **Table 2**). Several cases (n = 5, 7.0%) had ulceration; 1 case (1.4%) demonstrated multifocality; and 3 tumors (4.2%) were locally invasive into surrounding tissues. Additional cases showed nodular (n = 4, 5.6%), superficial/circumscribed (n = 4, 5.6%), or circumscribed (n = 3, 4.2%) growth patterns. Several tumors (n = 6, 8.5%) demonstrated mixed findings, including aggressive and nonaggressive pathologic features. Twenty-four tumors (33.8%) had unspecified aggressive growth patterns, and histopathologic findings were unavailable in 2 cases (2.8%). Three tumors (4.2%) exhibited perineural invasion or cartilaginous invasion (8.5%, n = 6) on final pathology, while none of the lesions exhibited lymphovascular invasion.

Reconstruction. Multiple methods were used for reconstruction following primary resection, including full-thickness (25.4%, n = 18) or split-thickness (29.6%, n = 21) skin grafts and local or regional pedicled flap reconstruction or skin advancement (25.4%, n = 18). Some patients (5.6%, n = 4) required a combination of reconstructive methods, while others (14.1%, n = 10) did not undergo formal reconstruction, and wounds were allowed to heal by secondary intent (**Table 3**).

Preoperative Imaging, Additional Treatment, and Recurrence. The majority of patients did not require preoperative imaging; however, 12.7% (n = 9) underwent computed tomography of the temporal bone or neck with contrast, and 2.8% (n = 2) underwent magnetic resonance imaging. Imaging was indicated in cases of long-standing disease, with greater tumor burden at the outset and with concerning locations deep into the intertragal notch or retroauricular crease, where occult local spread into the parotid gland, lymph nodes, or temporal bone could not be clinically determined. Adjuvant radiation was given in 1 case after primary resection due to aggressive histologic features found on final pathology.

Table 4. Auricular Subsite and Margin Status.[a]

Subsite	ICM	IFM	POM	Not reported
Helix	10 (66.7)		4 (26.7)	1 (6.7)
Antihelix	0 (0.0)		1 (100.0)	
Conchal bowl	12 (46.2)	12 (46.2)	1 (3.8)	1 (3.8)
Lobule	1 (100.0)			
EAC	2 (100.0)			
Intra-auricular with extension	1 (50.0)			1 (50.0)
Triangular fossa		1 (100.0)		
External ear, unspecified	2 (40.0)	2 (40.0)		1 (20.0)
Preauricular	1 (50.0)		1 (50.0)[b]	
Postauricular	7 (58.3)	1 (8.3)	2 (16.7)	2 (16.7)

Abbreviations: EAC, external auditory canal; ICM, initial clear margins; IFM, involved frozen margins (further margins sent to clear); POM, positive or overturned margins.
[a]Values are reported as No. (% by subsite).
[b]Could not clear margins in operating room.

Local recurrence was observed in 11.3% (n = 8) of cases, while 85.9% of tumors (n = 61) did not recur at the most recent follow-up. Data were not available for 2.8% (n = 2) of patients. Of these recurrent cases, 50.0% (n = 4) demonstrated ICMs; 25.0% (n = 2), POMs; and 1 case, IFMs. One patient with intraoperative IFMs did not undergo additional resection due to significant medical comorbidities.

Of those with recurrences, 7 patients chose to undergo an additional surgical procedure, while 1 patient did not. Four recurrent cases underwent WLE; 1, near total auriculectomy; and 2, radical resection of EAC skin and surrounding tissue. Surgical pathology on all local recurrences demonstrated BCC with aggressive features (eg, perineural invasion). Only 1 case exhibited a second recurrence, which was treated with WLE and adjuvant radiation.

Discussion

Cutaneous BCC in and around the external ear is common and poses unique treatment challenges given the complexity of the associated anatomy and proximity to other vital structures (parotid, EAC, facial nerve, etc).[11] This places a premium on surgical planning, resection with cleared pathologic margins, reconstruction, and follow-up. While MMS has excellent outcomes reported in the management of BCC, this procedure may not be available to all patients or indicated by tumor location or extent. High cure rates may be achieved with standard excision; thus, referral to otolaryngologists with expertise in excision of lesions in the periauricular anatomic region may lead to similar outcomes, with the added benefit of extensive training in auricular reconstruction. Aggressive histologic subtypes of BCC may exhibit local invasion of nearby tissues and structures, including bone, nerve, and brain.[12]

Most patients (71.8%) in our study were male, with a median age in the 70s, which is consistent with reported distribution of BCC among the population.[13] Nearly half (45.1%) were current or former smokers, and most had a history of significant sunlight/UV light exposure (87.3%). Of note, intensive early UV exposure is more strongly linked to BCC, whereas cumulative sun exposure appears to be more important for squamous cell carcinoma.[14,15] Some patients had a history of immunosuppression, diabetes, organ transplant, or treatment with immunosuppressive drugs. Many patients (64.8%) had a history of NMCC at other sites, which is consistent with the notion that a history of skin cancers is correlated with an increased risk for developing multiple BCC lesions.[16,17]

Cutaneous malignancies of the head and neck occur at a rate of 6% to 10% in the auricular or periauricular region.[18] However, limited reports stratify the lesions to specific anatomic subsites.[19] Of all periauricular/auricular lesions, we found that most tumors arise primarily on the auricle (80.3%), though the true primary site location may be a blend of periauricular locations if we consider prior management of pre- and postauricular lesions by services other than otolaryngology or lesions managed with MMS. Within the auricle, most BCC occurred in the conchal bowl, followed by the helix, while very few cases (2.8%) were located in the EAC proper, consistent with typical anatomic regions with greater exposure to UV light.[18] Lesions in these subsites may be associated with earlier identification and subsequent prompt treatment versus those in which identification may be more challenging (ie, within the EAC, triangular or scaphoid fossae, or other smaller discrete folds of the external ear or EAC).

Among all lesions with margin data reported (n = 65), 87.7% of cases (n = 57) demonstrated final cleared margins between ICMs, additional resection in the operating room based on IFMs, and additional procedures. Resection of head and neck cutaneous BCC has been reported to have cleared margins in 45.1% of cases, involved margins in 50.2% of cases, and close margins in 4.7% of cases.[20] Within our cohort, the highest rates of IFMs or POMs on

final pathology were auricular lesions of the conchal bowl and helix, respectively. Nearly half (46.2%) of conchal bowl lesions required additional resection after demonstrating IFMs. The irregular contours of the conchal bowl and limited anatomic accessibility are a possible explanation for additional margins in these cases.[21] A significant aesthetic concern of patients requiring resection of cutaneous periauricular lesions is the contour of the helix, as it is the most visible anatomic subunit of the ear.[22] Lesions are resected to maximize cartilage preservation and native symmetry of the ear, which may explain the increased need for additional resection or procedures.

Incomplete excision rates of BCC of the external ear has been reported to be as high as 13.2%, which is similar to what has been demonstrated in our patient population.[6] Half (n = 4, 50.0%) of all recurrent cases demonstrated ICMs, while the remaining 4 cases required additional resection due to IFMs (n = 1), had POMs (n = 2), or was unable to be cleared during initial resection due to patient comorbidities (n = 1). Of all cases with POMs, 7 were followed clinically, while 2 underwent additional procedures postoperatively. Two of 9 patients demonstrated recurrence, both of whom elected observation after the initial surgery, while 7 remained recurrence free without additional surgical intervention. Some studies have reported a lack of a statistically significant difference in tumor recurrence between completely resected lesions and lesions with positive margins, though recurrence rates may vary among histologic subtypes.[23,24] Controversy exists regarding close clinical follow-up versus immediate reoperation, and optimal management may vary by individual lesion characteristics. This may suggest a need for similar postoperative surveillance protocols regardless of final margin status, though overall recurrences were limited. Among lesions with POMs, the primary rationale for elective clinical observation instead of additional procedures was based on patient comorbidities or preferences, clinical judgment, or referral back to MMS to identify and clear the final margins while preserving native anatomy.

Historically, lesions of the outer auricle/helix or antihelix were treated with a full-thickness wedge resection that included skin and underlying cartilage. Some have argued that this method led to overtreatment, given that the majority of tumors are confined to the skin without invasion of the perichondrium or cartilage.[25] At our institution, the underlying cartilage is often taken out en bloc with the overlying skin/lesion and sent for permanent pathology. The deeper margins below the cartilage margin are rarely, if ever, positive for BCC. As such, the majority of lesions in our study required WLE alone (80.3%), but several cases required more extensive dissections. Six cases (8.4%) required predominantly partial auriculectomy, and 3 (4.2%) required partial parotidectomy. Regarding low-risk lesions, primary radiotherapy is indicated only in nonsurgical candidates or per patient preference, and adjuvant primary radiotherapy is recommended in the context of perineural invasion or perineural tumor spread, incomplete or close surgical margins, large tumors, locally advanced disease, lymph node involvement, or immunosuppression.[26]

Various guidelines exist for the surgical management of BCC; however, the varied distribution of histologic subtypes led to alternative approaches based on individual patient factors.[27] Histologically, low-risk lesions present with nodular or superficial growth patterns, whereas high-risk lesions demonstrate aggressive growth patterns, including basosquamous, sclerosing, mixed infiltrative, or micronodular features in any portion of the tumor.[28] Of all included cases, the majority (n = 58, 81.7%) demonstrated aggressive features on histopathology. Among the 11 cases requiring more extensive resection (eg, parotidectomy, neck lymph node dissection), surgical pathology revealed aggressive features, including ulceration and infiltrative patterns. Aggressive histologic subtypes harbor a greater risk of recurrence than nodular or superficial subtypes.[28,29] Additionally, the National Comprehensive Cancer Network defines high-risk tumors as occurring in those with immunosuppression or having any of the following: a high-risk location or size, poorly defined clinical borders, recurrence, rapid growth, neurologic symptoms, high-risk pathology, or a location in a site of previous radiation therapy or chronic inflammation.[30]

Management of recurrent BCC is challenging, as studies have reported a higher rate of additional recurrences as compared with recurrences of primary lesions.[31,32] Recurrence of primary BCC typically ranges from 2.3% to 10.1%, and the head and neck location is associated with an increased risk of recurrence.[33] Given the slightly higher rate of recurrence seen in our study, there may be a need for closer surveillance of lesions specific to the periauricular region, to monitor for recurrences of aggressive pathology. In our study, only 8 lesions (11.3%) exhibited local recurrence, all of which demonstrated aggressive histopathologic features on initial resection. All recurrences among our patient population occurred within 6 years, with the majority occurring within the first 3 years.

Conclusion

The high rate of BCC in the head and neck region demands effective management. Data from our study population revealed a large subset of tumors with aggressive histopathologic features in the high-risk periauricular region. Resection of BCC in and around the ear can be challenging due to anatomic access (folds of external ear, cartilage, or EAC involvement).

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Author Contributions

Mallory Peters, data analysis, manuscript preparation, figures and tables, editing; **Joshua D. Smith**, data collection, manuscript preparation; **Kevin J. Kovatch**, data collection, manuscript

preparation; **Scott McLean**, data collection, manuscript preparation; **Alison B. Durham**, data collection, manuscript preparation; **Gregory Basura**, project design, data collection, manuscript preparation and editing.

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References

1. Castanheira A, Boaventura P, Clemente MP, Soares P, Mota A, Lopes JM. Head and neck cutaneous basal cell carcinoma: what should the otorhinolaryngology head and neck surgeon care about? *Acta Otorhinolaryngol Ital*. Published online July 31, 2019. doi:10.14639/0392-100X-2245
2. Marzuka AG, Book SE. Basal cell carcinoma: pathogenesis, epidemiology, clinical features, diagnosis, histopathology, and management. *Yale J Biol Med*. 2015;88(2):167-179.
3. Totonchy M, Leffell D. Emerging concepts and recent advances in basal cell carcinoma. *F1000Res*. 2017;6:2085. doi:10.12688/f1000research.11314.1
4. Badash I, Shauly O, Lui CG, Gould DJ, Patel KM. Nonmelanoma facial skin cancer: a review of diagnostic strategies, surgical treatment, and reconstructive techniques. *Clin Med Insights Ear Nose Throat*. 2019;12:1179550619865278. doi:10.1177/1179550619865278
5. Kim JYS, Kozlow JH, Mittal B, et al. Guidelines of care for the management of basal cell carcinoma. *J Am Acad Dermatol*. 2018;78(3):540-559. doi:10.1016/j.jaad.2017.10.006
6. Luz FB, Ferron C, Cardoso GP. Surgical treatment of basal cell carcinoma: an algorithm based on the literature. *An Bras Dermatol*. 2015;90(3):377-383. doi:10.1590/abd1806-4841.20153304
7. Subramaniam P, Olsen CM, Thompson BS, Whiteman DC, Neale RE. Anatomical distributions of basal cell carcinoma and squamous cell carcinoma in a population-based study in Queensland, Australia. *JAMA Dermatol*. 2017;153(2):175-182. doi:10.1001/jamadermatol.2016.4070
8. Cumberland L, Dana A, Liegeois N. Mohs micrographic surgery for the management of nonmelanoma skin cancers. *Facial Plast Surg Clin North Am*. 2009;17(3):325-335. doi:10.1016/j.fsc.2009.06.001
9. Kheterpal S. *DataDirect: A Self-serve Tool for Data Retrieval*. University of Michigan; 2015. https://datadirect.med.umich.edu/
10. Hanauer DA, Mei Q, Law J, Khanna R, Zheng K. Supporting information retrieval from electronic health records: a report of University of Michigan's nine-year experience in developing and using the Electronic Medical Record Search Engine (EMERSE). *J Biomed Inform*. 2015;55:290-300. doi:10.1016/j.jbi.2015.05.003
11. Cigna E, Tarallo M, Maruccia M, Sorvillo V, Pollastrini A, Scuderi N. Basal cell carcinoma: 10 years of experience. *J Skin Cancer*. 2011;2011:476362. doi:10.1155/2011/476362
12. McGuire JF, Ge NN, Dyson S. Nonmelanoma skin cancer of the head and neck I: histopathology and clinical behavior. *Am J Otolaryngol*. 2009;30(2):121-133. doi:10.1016/j.amjoto.2008.03.002
13. Bassukas ID, Tatsioni A. Male sex is an inherent risk factor for basal cell carcinoma. *J Skin Cancer*. doi:10.1155/2019/8304271
14. Kricker A, Weber M, Sitas F, et al. Early life UV and risk of basal and squamous cell carcinoma in New South Wales, Australia. *Photochem Photobiol*. 2017;93(6):1483-1491. doi:10.1111/php.12807
15. Leiter U, Garbe C. Epidemiology of melanoma and nonmelanoma skin cancer—the role of sunlight. In: Reichrath J, ed. *Sunlight, Vitamin D and Skin Cancer*. Springer; 2008:89-103. doi:10.1007/978-0-387-77574-6_8
16. Kiiski V, Vries E de, Flohil SC, et al. Risk factors for single and multiple basal cell carcinomas. *Arch Dermatol*. 2010;146(8):848-855. doi:10.1001/archdermatol.2010.155
17. Karagas MR, Stukel TA, Greenberg ER, Baron JA, Mott LA, Stern RS. Risk of subsequent basal cell carcinoma and squamous cell carcinoma of the skin among patients with prior skin cancer. *JAMA*. 1992;267(24):3305-3310. doi:10.1001/jama.1992.03480240067036
18. Gustaitytė-Larsen D, Illum P. Non-melanoma skin cancer of the auricle is treated according to national guidelines. *Dan Med J*. 2013;60(3):A4587.
19. Kovatch KJ, Smith JD, Birkeland AC, et al. Institutional experience of treatment and outcomes for cutaneous periauricular squamous cell carcinoma. *OTO Open*. 2019;3(3):2473974X1987507. doi:10.1177/2473974X19875077
20. Janjua OS, Qureshi SM. Basal cell carcinoma of the head and neck region: an analysis of 171 cases. *J Skin Cancer*. 2012;2012:943472. doi:10.1155/2012/943472
21. Dessy LA, Figus A, Fioramonti P, Mazzocchi M, Scuderi N. Reconstruction of anterior auricular conchal defect after malignancy excision: revolving-door flap versus full-thickness skin graft. *J Plast Reconstr Aesthet Surg*. 2010;63(5):746-752. doi:10.1016/j.bjps.2009.01.073
22. Brodland DG. Advanced reconstruction of the ear: a framework for successful wound closure. *Dermatol Surg*. Published online September 2014. doi:10.1097/DSS.0000000000000116
23. Nagore E, Grau C, Molinero J, Fortea JM. Positive margins in basal cell carcinoma: relationship to clinical features and recurrence risk. A retrospective study of 248 patients. *J Eur Acad Dermatol Venereol*. 2003;17(2):167-170. doi:10.1046/j.1468-3083.2003.00535.x
24. Bozan A, Gode S, Kaya I, et al. Long-term follow-up of positive surgical margins in basal cell carcinoma of the face. *Dermatol Surg*. 2015;41(7):761-767. doi:10.1097/DSS.0000000000000394
25. Petersen JF, Borggreven PA, Koot VCM, Tegelberg MJAM, Lohuis PJFM. Paradigm change in the treatment of nonmelanoma skin cancer of the auricle: reconstruction with full thickness skin grafting instead of wedge excision. *Eur Arch Otorhinolaryngol*. 2015;272(7):1743-1748. doi:10.1007/s00405-014-3092-5
26. McDowell L, Yom SS. Locally advanced non-melanomatous skin cancer: contemporary radiotherapeutic management. *Oral*

Oncology. 2019;99:104443. doi:10.1016/j.oraloncology.2019.104443

27. Kiely JR, Patel AJK. A retrospective study of 694 basal cell carcinoma excisions to quantify deep margin documentation and clearance compared to histological type and surgical margin. *J Plast Reconstr Aesthet Surg*. 2019;72(11):1805-1812. doi:10.1016/j.bjps.2019.06.002
28. Bichakjian C. NCCN clinical practice guidelines in oncology: basal cell skin cancer. Published online 2018. Accessed April 16, 2020. https://oncolife.com.ua/doc/nccn/Basal_Cell_Skin_Cancer.pdf
29. Smeets NWJ, Kuijpers DIM, Nelemans P, et al. Mohs' micrographic surgery for treatment of basal cell carcinoma of the face—results of a retrospective study and review of the literature. *Br J Dermatol*. 2004;151(1):141-147. doi:10.1111/j.1365-2133.2004.06047.x
30. Danesh MJ, Menge TD, Helliwell L, Mahalingam M, Waldman A. Adherence to the National Comprehensive Cancer Network criteria of complete circumferential peripheral and deep margin assessment in treatment of high-risk basal and squamous cell carcinoma. *Dermatol Surg*. Published online March 2020. doi:10.1097/DSS.0000000000002354
31. Silverman MK, Kopf AW, Bart RS, Grin CM, Levenstein MSDS. Recurrence rates of treated basal cell carcinomas. Part 3: surgical excision. *J Dermatol Surg Oncol*. 1992;18(6):471-476. doi:10.1111/j.1524-4725.1992.tb03307.x
32. Miszczyk J, Charytonowicz M, Dębski T, Noszczyk B. Incomplete excision of basal cell carcinoma (BCC) in the head and neck region: to wait, or not to wait? *Postepy Dermatol Alergol*. 2017;34(6):607-611. doi:10.5114/ada.2017.72467
33. Morgan FC, Ruiz ES, Karia PS, Besaw RJ, Neel VA, Schmults CD. Factors predictive of recurrence, metastasis, and death from primary basal cell carcinoma 2cm or larger in diameter. *J Am Acad Dermatol*. Published online October 7, 2019. doi:10.1016/j.jaad.2019.09.075