AMERICAN ACADEMY OF OTOLARYNGOLOGY–HEAD AND NECK SURGERY FOUNDATION

Otolaryngology–Head and Neck Surgery
1–5

DOI: 10.1177/0194599815579885
http://otojournal.org
SAGE

The Role of Parotidectomy in the Treatment of Auricular Squamous Cell Carcinoma

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No sponsorships or competing interests have been disclosed for this article.

Abstract

Objective. We analyze parotid specimens in patients treated with prophylactic parotidectomy for squamous cell carcinoma of the auricle greater than or equal to 2 cm to determine rates of metastasis and the efficacy of elective resection.

Study Design. Case series with chart review.

Setting. Cancer treatment center in Fort Worth, Texas, from 1998 to 2013.

Subjects and Methods. The study included 104 patients between ages 36 and 97 years with primary auricular squamous cell carcinoma greater than or equal to 2 cm, with no evidence of adenopathy or parotid involvement on imaging. Patients underwent local excision and ipsilateral parotidectomy. The primary cancer was analyzed for vascular involvement, perineural invasion, and cartilage involvement, while the parotid specimen was analyzed for cancer positivity.

Results. Thirty-nine parotid (37.5%) samples were positive for carcinoma. Of these, 16 patients had primary auricular carcinomas with vascular involvement, 17 had perineural invasion, and 4 had cartilage involvement. Thirty-two of 77 affected men and 7 of 27 affected women had positive parotid specimen. Vascular involvement (P = .0006) and perineural invasion (P = .0027) of the primary lesion were significantly higher in patients with a positive parotid specimen. Cartilage involvement and sex were not statistically significant.

Conclusions. Elective parotidectomy is beneficial in patients with squamous cell carcinoma of the auricle at least 2 cm in size, especially in lesions having perineural invasion and vascular involvement. For patients with positive parotid specimens, we recommend postoperative external beam radiation therapy and close surveillance.

Keywords

parotidectomy, squamous cell carcinoma, auricle

Received January 5, 2015; revised February 23, 2015; accepted March 11, 2015.

Auricular cancers are most commonly found during the fifth and sixth decades of life. Light skin tone, blue eye color, blond or red hair, and male sex are all associated with a higher risk of developing these malignancies.[1,2] Due to the anatomical position of the auricle, it is thought to have a higher exposure to ultraviolet radiation and be prone to actinic damage.[3]

With an annual incidence greater than 1.2 million, skin cancer is the most common malignancy in the United States. Of all patients afflicted with skin cancer, 20% were found to be cutaneous squamous cell carcinomas.[4-9] Of those patient developing cutaneous malignancies, 5% to 10% involve the internal and external ear, including both the auricle and the external auditory canal.[10,11] The literature reports that 84% of cancers of the external ear involve the auricle.[11,12]

Auricular squamous cell carcinoma (SCC) is generally treated with surgical resection, with early lesions excised with Mohs micrographic surgery. For more advanced cancers, wide local excision may be needed in conjunction with neck dissection, temporal bone resection, or parotidectomy depending on the extent of spread.[13,14] The parotid was also included in the resection largely in part because adequate imaging modalities were not present until the recent past.

In 2008, Osborne et al[15] reported a 0% incidence of nodal or parenchymal parotid disease in 19 patients with auricular SCC undergoing auriculectomy with elective parotidectomy in the setting of clinical and radiographically negative regional disease. On the basis of their findings as well as the anatomic understanding that cancers of the external auditory canal have a

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Table 1. Inclusion and Exclusion Criteria for This Study.

Inclusion Criteria	Exclusion Criteria
Primary auricular squamous cell carcinoma at least 2 cm in size	Recurrent auricular squamous cell carcinoma
Normal facial nerve function	Other primary cutaneous squamous cell carcinomas extending into the auricle
No evidence of adenopathy on imaging	Metastases to the auricle
No evidence of parotid involvement on imaging	Temporal bone or external auditory canal lesions
	Patients with preoperative facial nerve paralysis or paresis

significantly higher propensity to spread to the parotid than auricular cancers, they concluded that elective parotidectomy may not be necessary in patients with isolated auricular SCC in the absence of clinical or radiographic regional metastases.[15]

Currently, the decision to perform an elective parotidectomy on patients with isolated auricular SCC remains controversial, especially in the setting of clinically and radiographically negative disease. Several previous studies have quoted up to an 18% incidence of parotid involvement in auricular carcinoma and up to a 50% increased risk of parotid metastases in patients treated solely with auriculectomy or wedge excision.[3,16]

One of the inherent challenges with interpreting the previous studies is the lack of stratification between subsites of the external ear. Many have reported the combined results from auricular and external auditory canal carcinoma under the external ear. This has made it difficult to discern what the true incidence of parotid involvement is in isolate auricular carcinomas and whether or not elective parotidectomy is of benefit for these patients.

Our data from 104 patients undergoing elective parotidectomy for isolated auricular SCC suggest that elective parotidectomy may be beneficial in patients with isolated auricular SCC of at least 2 cm in size. To our knowledge, this is the largest retrospective study regarding this topic in the English literature.

Materials and Methods

Institutional review board approval was sought from the University of Texas Southwestern committee, and the study was granted exemption.

This study involved 104 patients who were diagnosed with biopsy-proven primary SCC of the auricle. Patients with recurrent carcinoma or patients in whom another carcinoma extended into the auricle were excluded. In the same way, patients with external auditory canal or temporal bone lesions were excluded as well. External auditory canal involvement was defined as involvement beyond the conchal bowl, while tragal involvement was defined as overt cartilage involvement. Although auricular carcinomas can extend into the postauricular sulcus to the junction of the conchal bowl and cartilaginous external auditory canal, this was not considered external auditory canal involvement unless the canal had to be removed. All patients underwent computed tomography (CT), magnetic resonance imaging (MRI), or positron emission tomography (PET) to assess for adenopathy and regional metastasis. Only patients with negative imaging were included in the study. **Table 1** summarizes inclusion and exclusion criteria for this study.

These patients were treated from 1998 to 2013 with excision of the primary auricular cancer followed by prophylactic superficial parotidectomy. All patients preoperatively had normal facial nerve function. The patient population included 104 patients, 77 male and 27 female, between the ages of 36 to 97 years, with the mean age being 71.5 years.

Following parotidectomy, parotid specimens were analyzed for lymph node positivity through pathologic analysis. The lymph nodes associated with the parotid specimen were those located near the parotid tail. The total number of intraparotid nodes was not available. The primary auricular cancer was also analyzed for perineural invasion, vascular involvement, and cartilage involvement. At the senior author's (Y.D.) institution, the pathology department routinely comments on perineural and vascular involvement for every case. All cases are reviewed by the same pathology group, and any specimen positive for cancer is reviewed again by a second pathologist from the same group.

Using an unpaired t test and α value of .05 for significant vascular involvement, perineural invasion, cartilage involvement, and sex were all analyzed between the groups with cancer-positive and cancer-negative parotid specimens to determine significant differences. Using a χ^2 test with an α value of 0.05, the association between lesion size and positive parotid specimens was also analyzed. The odds ratio was then calculated for patients with parotid positivity having vascular or perineural invasion at the primary lesion, as seen in **Table 2**.

Results

After completion of the study, the data were analyzed and are presented as follows. Of the 104 patients in the study found to have biopsy-proven SCC of the auricle, 32 male patients (41.5%) and 7 (25.9%) female patients had positive parotid specimens. Sex was not found to be significantly different in patients with and without positive parotid specimens ($P = .15$).

When examining the composite group primary specimens, it was noted that 36 of the 104 patients had primary site cancers measured from 2 to 2.9 cm, with 8 of those patients having positive parotid specimens. Thirty-eight

Table 2. Odds Ratio Calculation for Vascular Involvement and Perineural Invasion in Patients with Parotid Positivity.

	Vascular Involvement and Positive Parotid Specimen	Perineural Invasion and Positive Parotid Specimen
Odds ratio	4.95	2.67
Confidence interval	1.86-13.16	1.02-6.96
P value	.0013	.0436
Significance	Statistically significant	Statistically significant

Table 3. Parotid Involvement Stratified by Primary Lesion Size.

Size of Primary Lesion	Total Patients, No. (%)	Positive Parotid, No. (%)	Negative Parotid, No. (%)
2-2.9 cm	36 (34.6)	8 (20.5)	28 (43)
3-3.9 cm	38 (36.5)	13 (33.3)	25 (38.4)
4 cm or larger	30 (28.8)	18 (46.1)	12 (18.4)
Total	104	39	65

patients had primary tumors ranging from 3 to 3.9 cm, with 13 having positive parotid specimens. Thirty patients had tumors 4 cm or larger, and of those, 18 had positive parotid specimens. **Table 3** displays the above data. To determine whether the positivity of the parotid specimen was related to the size of the primary auricular cancer, a χ^2 test was conducted, yielding a χ^2 statistic of 10.2 and a P value of .0059. Comparing against an α value of .05, there is strong evidence that the positivity of the parotid specimen is indeed related to the size of the initial cancer.

Vascular involvement, perineural involvement, and cartilage involvement in the primary auricular lesion were compared among patients with positive and negative parotid samples. Of the 39 patients with positive parotid specimens, 16 had vascular involvement in the auricular lesion, 17 had perineural invasion, and 4 had cartilage involvement. Of the 65 patients without parotid involvement, 8 had vascular involvement, 11 had perineural invasion, and 6 had cartilage involvement. Using an unpaired t test and α value of .05, it was found that the difference in vascular involvement (P = .0006) and perineural invasion (P = .0027) was statistically significant between patients with parotid involvement and those without (**Tables 4** and **5**). The difference in cartilage involvement was not statistically significant (P = .86). The odds ratio for vascular involvement in patients with parotid involvement was 4.95 (P = .0013), and the odds ratio for perineural invasion in patients with parotid involvement was 2.67 (P = .0436), suggesting that there is a relationship between parotid involvement the presence of these features.

All patients with positive parotid specimens were recommended for postoperative external beam radiation therapy to the parotid bed and ipsilateral neck. Thirty-two of the 39 patients were compliant with therapy. In the 7 patients who did not undergo radiation therapy, 2 cancers recurred regionally, 2 recurred distally, and 1 recurred locally. Four patients died, and the remainder had surgery and radiation therapy. Of the patients with negative parotid specimens, 2 cancers recurred in the neck, 1 in the parotid, and 1 distally; 1 patient died.

Discussion

Our retrospective review of 104 patients undergoing elective parotidectomy for auricular SCC of at least 2 cm in size with clinically and radiographically negative nodal disease suggests that elective parotidectomy may be beneficial in this patient population. To our knowledge, this has been the largest population included in a retrospective study to address this controversial issue in the English literature.

Our study showed that patients with positive parotid disease had significantly higher incidence of perineural (P = .0027) and vascular involvement (P = .0006) in the primary cancer site compared with those patients without parotid involvement. Although perineural and vascular invasion was assessed in relationship to parotid positivity, it can be inferred that patients who have these findings at the time of initial resection, whether on frozen section in the operating room or from prior Mohs surgery, have a strong likelihood of parotid metastases. Although more data are needed to calculate positive predictive values, our results are suggestive of an association.

On the contrary, cartilage involvement (P = .86) was not found to be significantly different in patients with and without parotid metastases from the primary auricular cancer. Male sex was also not found to be significantly different in the 2 groups of patients. Although males have previously been reported to have a higher risk of developing auricular carcinoma, it does not appear that this finding translates to the development of parotid disease.[1,2]

In 2008, Osborne et al[15] performed a retrospective trial on 19 subjects undergoing auriculectomy and elective parotidectomy for auricular cancer. In their study, 58% of lesions were SCC, and 42% were basal cell carcinoma; all tumors were between 2 and 7 cm in size. They reported 0% incidence of parotid disease in patients with clinically and radiographically negative nodal disease and thus recommended against elective parotidectomy for auricular cancers. Their study, however, combined results for squamous cell and basal cell cancer and did not differentiate the parotid disease between the 2 types. Since SCC and basal cell carcinoma behave quite differently, this could have been a potential source of confounding for their overall conclusion.

Freedlander and Chung[16] in 1983 reported on 160 patients with auricular SCC being treated solely with primary excision. Fifteen of those patients had parotid metastases during the follow-up period, suggesting that lesions greater than 3 cm were strongly linked with increased incidence of parotid metastases. In 1992, Yoon et al[17] reported

Table 4. Vascular Involvement in Primary Lesion of Patients with and without Parotid Involvement.

	Vascular Involvement of Primary Lesion in Patients with Positive Parotid Specimen	Vascular Involvement of Primary Lesion in Patients with Negative Parotid Specimen
Patients with involvement	16	8
Mean	0.41	0.12
Standard deviation	0.5	0.33
Standard error measurement	0.08	0.04
N	39	65
P value	.0006	
Significance	Statistically significant	

Table 5. Perineural Invasion in Primary Lesion of Patients with and without Parotid Involvement.

	Perineural Invasion of Primary Lesion in Patients with Positive Parotid Specimen	Perineural Invasion of Primary Lesion in Patients with Negative Parotid Specimen
Patients with nerve involvement	17	11
Mean	0.44	0.17
Standard deviation	0.5	0.38
Standard error measurement	0.08	0.05
N	39	65
P value	.0027	
Significance	Statistically significant	

on 4 of 40 patients developing recurrent disease in the parotid gland following excision of primary auricular cancer. It is important to note that both of these studies did not differentiate between the auricle and external auditory canal.

It is important to differentiate the rates of regional spread between the auricle and external auditory canal as the anatomy and developmental patterns of each subsite differ significantly. The auricle typically drains into the pre- and postauricular nodal basins, while the external auditory canal drains into the pre- and postauricular nodal basins along with the superficial parotid nodal basins and occasionally the jugulodigastric nodes.[15] The lymphatic drainage of the external auditory canal into the parotid nodes, as well as the fissures of Santorini and Huschke in the anterior canal, allows for multiple routes of disease spread from the canal to the parotid gland. The auricle does not have direct connections with the parotid gland, and as such, direct extension is typically not seen. The auricular skin is more tightly adherent anteriorly than posteriorly, and therefore direct extension of tumors typically occurs in a posterior direction.[15]

Our findings have been corroborated by recent literature by Peiffer et al.[18] In a study of 41 patients who had elective neck dissection and parotidectomy in light of primary auricular cancers, 58.5% had positive nodes on the resection specimens. Of these, 18.2% of patients had occult parotid disease. This study supports our recommendation of elective parotidectomy in the N_0 patient with primary isolated auricular SCC of at least 2 cm in size. All patients with positive parotid specimens should be evaluated for external beam radiation and maintain close clinical follow-up with examination and imaging.

In the English literature, this has been the largest study to date examining the need for elective parotidectomy in this population. Although our data support elective parotidectomy, it is important to note that in patients with perineural or vascular involvement at the primary tumor site, one could equally justify the use of adjuvant radiation without surgical treatment. Radiation therapy could also be used as an alternative to surgery in patients who refuse surgical extirpation or those who are poor surgical candidates based on their medical status. In our study, 3 patients also had preauricular/parotid nodes without the above-mentioned pathologic findings at the primary site. As such, this justifies our proposed approach in that elective parotidectomy could be used as a staging operation to determine the need for postoperative radiation.

In the future, this study could be extended to also examine the utility of elective modified neck dissection in this population. A multicenter prospective randomized trial would be beneficial in elucidating true differences in treatment options, recurrence statistics, and the positive predictive value of pathologic features of the primary site cancer such as cartilage, perineural, or vascular invasion. More so, a study of genetic markers could also be conducted to determine molecular features of auricular cancer that predispose it to early, aggressive behavior. The role of sentinel node biopsy in these patients has not been studied and could have utility in determining which patients would be more likely to develop disease in the parotid gland prior to elective removal.

Conclusions

On the basis of our findings, we recommend that patients with isolated auricular SCC of at least 2 cm in size without clinical or radiographic evidence of nodal disease should undergo elective parotidectomy. For patients with positive parotid disease, postoperative radiation could be considered, and the pathology results may assist in decision making regarding further therapy.

Author Contributions

Sameep Kadakia, wrote article, data analysis, data interpretation, final approval for all aspects of work; **Masoud Saman**, article revision, design, writing, final approval for all aspects of work;

Eli Gordin, article revision, conception, data interpretation, editing and final approval for all aspects of work; **Diego Marra**, data collection, revision, final approval for all aspects of work; **Yadranko Ducic**, data collection, article revision, final approval for all aspects of work.

Disclosures

Competing interests: None.

Sponsorships: None.

Funding source: None.

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