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ORIGINAL RESEARCH

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Pattern of nodal metastasis of cutaneous squamous cell carcinoma involving the temporal bone

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Abstract

Objective: The objective of this study was to explore the pattern of lymph-node spread of SCCs involving the temporal bone.

Methods: We retrospectively reviewed all cutaneous SCCs involving the temporal bone over a 20-year time-period. Forty-one patients were eligible.

Results: Mean age was 72.8 years. The diagnosis was cutaneous SCC in all cases.

All patients underwent a temporal bone resection, 70.7% had a neck-dissection and 78.0% a parotidectomy.

Level 2 was the most common area of neck metastasis, and occurred in 12.2%. The parotid had disease in 34.1%. 51.2% of patients underwent free-flap reconstruction.

Mean overall survival of the cohort was 4.2 years.

Conclusions: Overall, the rate of cervical nodal metastasis was 22.0% and 13.5% in the occult setting. The parotid was involved in 34.1% and 10.0% in the occult setting. Results from the present study support consideration for performing a parotidectomy at the time of temporal bone resection, while a neck dissection can be performed for adequate staging of the nodal basin.

Level of Evidence: 3

KEYWORDS

cutaneous, lymph node, metastasis, temporal bone

1 | INTRODUCTION

Malignancies involving the temporal bone are rare, and account for less than 1% of all head and neck malignancies.[1–3] Treatment of these lesions involves surgical resection, along with adjuvant radiotherapy, in the majority of cases. Surgical approaches have changed

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over time, with surgery evolving from radical mastoidectomy alone,[4] to en bloc subtotal temporal bone resections as described by Parsons and Lewis,[5] to finally lateral temporal bone resections (LTBR), first introduced by Conley and Novack.[6] This method remains the gold standard surgical approach for malignancies involving the temporal bone.

While surgical approaches to the temporal bone have evolved and improved over time, there is still no clear evidence on how to manage parotid and neck disease in cutaneous malignancies involving the temporal bone.

At present, there is still no recognized staging system for malignancies of the temporal bone. The American Joint Committee on Cancer (AJCC) and the Union Internationale Contre le Cancer (UICC) do not have staging systems for temporal bone malignancies,[7] with the most widely used system being the University of Pittsburgh staging system, described by Arriga et al.,[8] and updated by Moody et al.[7] The most consistently demonstrated variables associated with outcome are Pittsburgh stage and surgical margin status, along with evidence of extra-temporal spread.[2,3,9]

The objective of the present study was to explore the pattern of lymph node spread of cutaneous squamous cell carcinomas (SCCs) involving the temporal bone, as well as determine the rate of spread to the parotid gland.

2 | METHODS

2.1 | Data collection

This multi-center study involved the major centers of head and neck and skull base surgery across the Republic of Ireland. The study was approved by the Beaumont Hospital and the St. James' Hospital Ethics committees. A retrospective search was performed of all patients who had malignancies involving the temporal bone from January 1, 2002 to September 1, 2021 at two tertiary referral centers for head and neck and lateral skull base surgery (Beaumont Hospital and St. James's Hospital, Dublin, Ireland). Malignancies arising from the parotid region, pre- and postauricular region, pinna and external auditory canal were considered, and only if they had evidence of invasion of the temporal bone. Seventy-one Patients were identified from the initial search strategy. Patients with cutaneous SCC were included, while all other pathologies were excluded ($n = 6$). Nineteen patients were deemed unresectable and were referred for palliative treatment and five patients were excluded due to incomplete data. This left 41 patients for final analysis.

Patient demographics were recorded, along with primary pathology, preoperative T-, and N-staging according to AJCC 8th edition for cutaneous malignancies, type of neck dissection performed, type of parotidectomy and pinnectomy performed. Histological data points included for analysis were depth of invasion, total lymph node yield, positive cervical, and parotid lymph nodes.

Overall survival (OS) and disease specific survival was recorded.

TABLE 1 Treatment characteristics

	N	%
LTBR	41	100
Pinnectomy	29	70.7
Parotidectomy	32	78.0
Superficial	19	46.3
Total	13	31.7
Neck dissection	29	70.7
Radical ND	4	9.8
Modified radical ND	15	36.6
Selective	10	24.4
Free flap reconstruction	21	51.2

2.2 | Statistical analysis

Statistical analysis was performed using SPSS ver 26.

One-way ANOVA was used to compare means, while survival was calculated using Kaplan–Meier curves and comparisons made using Log Rank. Unless otherwise specified, all data are reported as mean ± standard deviation (SD). A p-value of less than or equal to .05 was deemed statistically significant.

3 | RESULTS

Forty-one patients were included in the final analysis. Male to female preponderance was 3.5:1. Mean age at the time of surgery was 72.8 ± 12 years. The histological diagnosis in all patients was cutaneous SCC.

The majority of patients (51.2%) were staged T3 on imaging ($n = 21$), followed by T4 in 43.9% ($n = 18$), and T2 in only 4.9% ($n = 2$).

Most patients were staged N0 on imaging (90.2%, $n = 37$), while 7.3% ($n = 3$) and 2.4% ($n = 1$) of patients were N1 and N2 on imaging, respectively.

Finally, 73.2% ($n = 30$) of patients did not have evidence of disease in the parotid on imaging, while 26.8% ($n = 11$) of patients had either evidence of intra-parotid nodal disease or concern for direct invasion into the parotid gland.

3.1 | Operative characteristics

All patients underwent a LTBR, while 70.7% ($n = 29$) underwent a pinnectomy. Seventy-eight percent of patients also underwent a parotidectomy at the same time, whereas 70.7% of patients had a neck dissection. Patients did not received a parotidectomy if their primary disease was sufficiently remote from the parotid gland (postauricular skin) and were adequately staged clinically and radiology preop, and did not receive a neck dissection if their comorbidities necessitated a quick surgical time, or if they were likely to receive postoperative

TABLE 2 Parotid and nodal spread

	Overall		Occult	
	N	%	*N*	%
Parotid (P+)	14	34.1	3	10.0
Direct invasion	4	9.7	0	0
Intra-parotid nodes	10	24.4	3	10.0
Neck (N+)	9	22.0	5	13.5
Level 1	1	2.4	0	0
Level 2	5	12.2	3	8.1
Level 3	3	7.3	1	2.7
Level 4	2	4.9	1	2.7
Level 5	2	4.9	1	2.7

adjuvant radiotherapy. In all cases where patients did not have a neck dissection, the nodal basin was treated with postoperative radiotherapy. A full break-down of the types of parotidectomy and neck dissection performed can be found in Table 1. Level 1 was dissected in 46.3% of cases, level 2 in 70.7%, level 3 in 53.7%, level 4 in 53.7%, and level 5 in 39.0%. Free flap reconstruction was performed in 51.2%. All but one patient with evidence of parotid disease on imaging underwent a total parotidectomy.

3.2 | Pathological characteristics

The average maximal dimension of the primary tumor was 41.8 ± 23 mm, with the average depth of 20.1 ± 19 mm. The average total nodal yield was 29.7 ± 18 with a range of 2–70. Nine patients (22%) had positive cervical lymph nodes, and 14 patients (34.1%) had evidence of parotid disease of which 28.5% ($n = 4$) were due to direct invasion into the parotid gland. Excluding the cases with evidence of nodal disease on preoperative imaging, the rate of occult nodal disease was 13.5%. When excluding the cases that had evidence of parotid disease in imaging, the rate of occult parotid disease was 10%.

The most common cervical region of spread was level 2 in 12.2%. A full break-down of nodal and parotid disease can be found in Table 2.

Depth of the specimen influenced the risk of nodal disease ($p = .03$), but did not influence the risk of parotid disease ($p = .59$).

3.3 | Survival analysis and recurrence

Locoregional recurrences occurred in 11 patients (26.8%), with the mean time to recurrence being 9.7 months.

The mean OS for the cohort was 4.2 ± 0.79 years, while the mean disease specific survival (DSS) was 5.7 ± 0.92 years. Comparing OS between patients who had evidence of nodal disease (N+) vs. patients who did not (N0), we found no difference in OS ($p = .49$). There was also no statistical difference in OS in patients who had parotid disease (P+), vs. those who did not (P0) ($p = .82$). DSS was also not statistically different based on nodal status ($p = .49$) or parotid involvement ($p = .84$). OS and DSS did not differ statistically between groups based on T-staging ($p = .66$ and $p = .67$, respectively).

4 | DISCUSSION

Temporal bone malignancies are associated with poor prognosis. Their rarity, diversity, and complexity leads to difficult surgical interventions, and poorer understanding of oncologic outcomes.[3] Multiple previous studies have described varying cohorts and outcome data, further demonstrating the complex nature of this disease.[3,10–15]

The aim of the present study was to identify the rate and pattern of nodal and parotid spread in cutaneous SCCs involving the temporal bone. The risk of developing nodal metastasis in the cohort was 22.0%, while the risk of developing parotid disease was 34.1%. While the rate of neck nodal metastasis was higher than in previously reported studies,[3] the rate of parotid disease was similar.[3] However, when examining the risk of occult disease, the rates of spread dropped to 13.5% for the neck and 10% for the parotid. The most common area of cervical metastasis was level two in 12.2% (8.1% for occult disease) followed by level three in 7.3% (2.7% occult), level 4 and 5 in 4.9% each (2.7% occult), and level 1 in 2.4%. The parotid was involved in 34.1%, but fell to 10.0% in the occult setting. These data are in keeping with previously published data on the rate and risk of spread of cutaneous malignancies to the cervical nodal basin.[16,17]

The goal of surgery should be to achieve an R0 resection of the main specimen and remove gross metastatic disease, along with proper staging of the nodal basin. As most of these patients require adjuvant postoperative radiotherapy, an elective neck dissection for N0 neck may not be necessary.[3,17] Furthermore, as parotid and neck nodes are part of the same nodal basin, evidence of parotid disease effectively means node positive disease, which will necessitate adjuvant radiotherapy. Data from Palme et al. also demonstrates that presence of parotid disease carries similar prognostic importance to cervical node positivity.[18] Despite this, we routinely perform a neck dissection in the clinically N0 neck for locally advanced or very extensive cases in high-risk anatomic locations. Performing a neck dissection can help to reduce the radiotherapy dose and field in the pathologically N0 setting, with the National comprehensive cancer guidelines recommending a reduction in dose in the adjuvant setting from 60–66 Gy to 50–60 Gy in the absence of extra-nodal extension.[19] In addition to this, 51.2% of our cohort required free flap reconstruction of the defect, so a neck dissection was performed at the same time as preparing vessels for microvascular reconstruction. Based on data from the present study on patterns of nodal spread, in the elective setting a dissection of levels 2, 3, upper 4 can be considered for adequate staging of the nodal basin.

Data from the present study also demonstrated a high rate of parotid disease, with 34.1% of patients showing evidence of malignant spread to the parotid gland. However, when excluding cases that

had evidence or suspicion of parotid disease, the risk of occult nodal disease dropped to 10%. While no consensus exists as to when to perform a parotidectomy, previous articles have demonstrated rates of parotid spread similar to the data of the present study.[3] In our cohort, 78.0% of patients underwent a parotidectomy, and we routinely consider performing this for locally advanced or very large tumors, especially of the anterior external auditory canal and anterior pinna lesions, evidence or suspicion of parotid disease on preoperative investigation and as an adjunct for performing dissection of the mastoid segment of the facial nerve. While the deep lobe of the parotid is always closely inspected following removal of the superficial portion, a deep lobe parotidectomy is usually only performed if there is evidence of gross disease. All but one patient with evidence of intra-parotid disease on imaging underwent a deep lobe parotidectomy. Previous articles have demonstrated a risk of occult disease of up to 26% in the deep lobe of the parotid gland when the superficial lobe was involved, and some advocate for a routine dissection of the deep lobe when the superficial parotid lobe is involved,[20,21] while others adjuvate against routinely performing it.[22] Ultimately the role of surgery is to adequately stage the nodal basin to determine the patients candidacy for adjuvant radiotherapy, and not to remove all microscopic disease. There are no consensus guidelines for postoperative contouring of cutaneous SCCs for adjuvant radiotherapy, but prophylactic irradiation to the nodal basin should be considered when the risk of occult disease exceeds 15%.[23] Given the low risk of occult disease in the parotid gland (10%), a reduction in radiation to the parotid gland can be considered in very posterior lesions in the absence of any clinical or radiological suspicion, to help reduce the associated morbidity of irradiation to salivary glands, however this would require careful multi-disciplinary discussion on a case-by-case basis. A reduction in dose to level 1 cervical nodal station may also be considered given the very low risk of nodal spread at 2.4%.

OS of the cohort was 4.2 ± 0.79 years, while DSS was 5.7 ± 0.92 years. These figures are comparable to previously published outcomes.[1,4,24] Although the present study did not find a statistically significant reduction in OS and DSS in patients with N+ disease, despite a reduction in mean survival, there are data to suggest poorer prognosis in patients with lymph node involvement.[1,25] The failure of the present study to demonstrate this difference most likely arises from the limited sample size.

5 | CONCLUSIONS

Cutaneous malignancies involving the lateral temporal bone are complex malignancies to manage. Surgical treatment has evolved significantly, with a lateral temporal bone resection being the standard of care at present. Data from the present study has identified a risk of parotid involvement of 34.1% and 10.0% in the occult setting, while the rate of nodal metastasis was 22.0% and 13.5% in the occult setting. We support the consideration for a parotidectomy for locally advanced or large malignancies and in cases of suspicion for metastasis. A neck dissection can be performed to fully stage the nodal basin, help reduce the radiotherapy dose and field in the pathologically N0 setting, in cases where there is clinical suspicion for metastasis and when free flap reconstruction requires dissection of vessels.

CONFLICT OF INTEREST

The authors declare no funding source or conflict of interest.

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