Squamous Cell Carcinoma of the External Auditory Canal

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ABSTRACT

Objectives: This study aims to analyze the treatments, prognostic variables, and outcomes of patients with squamous cell carcinomas (SCC) of the external auditory canal (EAC) and middle ear treated in our department over a 15-year period. **Design:** A retrospective analysis of 19 patients treated in our department between 1990 and 2006. The patients were staged according to the Pittsburgh classification. Patients were treated with either a lateral (LTBR) or an extended temporal bone resection (total or subtotal). Parotidectomy was performed in patients with suspected clinical or radiological invasion and postoperative radiotherapy was the adjuvant treatment in most patients in advanced stages. **Results:** The overall 5-year survival was 37%. There were no patients in stage I. The survival rates were 100%, 25%, and 16% for stages II, III, and IV, respectively. Facial nerve paralysis ($p = 0.007$) and lymph node involvement ($p = 0.006$) were associated with decreased survival rates. **Conclusion:** SCC of the temporal bone are rare but have a poor prognosis. Lymph node involvement and facial nerve palsy are associated with a poorer outcome. These tumors must initially be treated radically, for which an early diagnosis is important.

KEYWORDS: Carcinoma of the external auditory canal, squamous cell carcinoma, ear neoplasms, temporal bone surgery, temporal bone tumors

Carcinoma of the temporal bone represents one out of 5000 to 20,000 otologic cases,^{1,2} with an incidence between 1 and 6 cases per million population per year.^{3,4} Squamous carcinoma is the most frequent neoplasm in the external auditory canal (EAC), about four times more common than basal carcinomas. This ratio is reversed in the pinna. Unlike squamous carcinomas of the auricle, which

are consistently associated with actinic damage, no such relationships exist for lesions in the auditory canal.⁵ These tumors have been associated with chronic suppurative otitis media and exposure to chemicals, though the most important factor may be previous radiotherapy.⁶

Most squamous cell carcinomas (SCC) of the temporal bone occur in the fifth and sixth decades of

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life. Otorrhea is the primary symptom, and otalgia, hearing loss, and bleeding may be frequent as well. Diagnosis is usually delayed because symptoms are quite similar to other benign otologic conditions such as chronic suppurative otitis media.

These tumors have an aggressive nature and spread along preformed vascular and neural pathways, invading adjacent structures.¹ Treatment usually combines surgery with free margins and radiotherapy. Surgery alone may be used for very early stages (T1), whereas radiotherapy alone is rarely used.

The extent of disease, positive margins, dural involvement, facial nerve paralysis, cranial nerve involvement, or moderate to severe pain on presentation have been associated with poorer outcomes.⁷

Early surgical attempts to remove these tumors usually involved high morbidity and mortality. These mortality rates have substantially decreased from Lewis's⁸ series to the more recent series of Moffat et al⁹ and Yin and associates¹⁰ as a result of advances in surgery and radiotherapy in the last three decades. The overall 5-year survival rates rank between 40% and 70%, but only reach 20% when advanced stages are considered. The main cause of death is local recurrence rather than regional or metastatic disease.^{11,12}

MATERIAL AND METHODS

This study is a retrospective analysis of 19 patients with SCC of the temporal bone (11 men and 8 women between 38 and 84 years old [mean age, 65 y; range, 38 to 84 y]), who were treated at our institution between 1990 and 2006. In an earlier study, 13 patients were analyzed using the classification system proposed by Shih and Crabtree.¹³ These patients have not been included in the present study.¹⁴ We have specifically excluded patients with tumors that invaded temporal bone from adjacent structures, metastatic tumors, and tumors of the pinna. Patients were classified according to

the classification system proposed by Arriaga et al in 1990.¹⁵

Seven patients (37%) had a history of previous radiotherapy on this area between 2 and 24 years before presentation, (mean, 11 y). Five patients (26%) had chronic suppurative otitis media, 2 patients (11%) had other epidermoid or basocellular skin cancer, and 7 (37%) were smokers. Some of them presented several of these predisposing factors.

Symptoms had been present between 2 weeks and more than 1 year, although most of the patients had symptoms for 1 to 6 months before consultation. Most frequent symptoms and signs were otorrhea (13 patients), otalgia (9), hearing loss (6), bleeding (5), and facial palsy (4). Less frequent was the presence of an aural or preauricular mass.

All patients received preoperative and postoperative computed tomography (CT) scans and/or magnetic resonance. Following the classification of Medina and associates, patients with T2N0 tumors were treated with an LTBR. Patients with stage III or IV were treated with either an LTBR or an extended temporal bone resection (total or subtotal)¹⁶.

We performed a parotidectomy in tumors involving the anterior wall of the EAC. We performed neck dissection only in the case of clinically positive necks. We obliterated the EAC and most of the time reconstructed the defect with a temporalis muscle flap. Two patients were lost to follow up.

RESULTS

The distribution of the patients by stages is shown in Table 1. There were no patients with T1N0 disease (stage I). Three patients (16%) presented with T2N0 disease (stage II) and 3 patients (16%) had T3N0 disease (stage III). Finally, there were 13 patients (68%) in stage IV. Ten patients (53%) presented with T4N0 disease, 1 patient (5%) presented with T2N1 disease, 1 patient (5%) presented

Table 1 Distribution of Patients by Stages According to the Classification System Proposed by Arriaga and colleagues¹⁵

	N0 (Number of Patients)	N1-2-3 (Number of Patients)
T1	I (0)	III (0)
T2	II (3)	IV (2)
T3	III (3)	IV (0)
T4	IV (10)	IV (1)

with T2N2 disease and another patient (5%) presented with T4N1 disease.

If we consider the surgical technique, six patients (32%) underwent an LTBR type II, five patients (26%) underwent an LTBR type III, and six patients (32%) a total or subtotal temporal resection. Two patients were treated palliatively because they had temporal lobe involvement and were medically unfit for surgery; these patients were excluded from the analysis (Table 2).

A superficial parotidectomy was performed in three patients (all patients had T4 disease, and the facial nerve had to be sacrificed), and a total parotidectomy was performed in six patients (one patient had T3 disease and five patients had T4 disease, the facial nerve being preserved in two patients with T4 disease).

The temporalis flap was the most commonly used muscle flap for reconstruction in 14 patients, although an assortment of techniques such as skin grafts (5 patients), parascapular free flap (1 patient), and sternocleidomastoid flap (1 patient) were also used.

Twelve patients received postoperative radiotherapy, and one patient received radiotherapy and chemotherapy after surgical resection.

As complications, five patients developed a cerebrospinal fluid leak. Two cases resolved after bedrest in a semisitting position, two cases required a lumbar puncture, and in one case we used an abdominal fat graft to close the fistula 1 month after surgery. Two patients presented wound dehiscence and infection, one patient presented a temporal seroma, and finally one patient suffered acute myocardial infarction, followed by acute pulmonary

Table 2 Clinical Distribution of Patients with (Squamous Cell Carcinoma) of the External Ear and Survival Outcome

Patient Age	Stage	Treatment	Follow-Up (mo)	Outcome
53	T4N0	LTBR II	0.36	LNED
69	T2N0	LTBR II	0.4	DOC
78	T4N0	No surgery	1.7	DOD
70	T2N1	LTBR II + RT	2.5	DOD
84	T4N0	No surgery	4.6	DOD
38	T4N1	TTBR + RT + QT	6.5	DOD
62	T4N0	STTBR + RT	6.8	NED
78	T4N0	LTBR III + RT	7	NED
80	T4N0	LTBR III + RT	10.4	DOD
47	T4N0	LTBR III + RT	12.3	DOD
54	T3N0	TTBR + RT	16.2	DOD
80	T3N0	LTBR III	24.2	DOD
54	T4N0	TTBR + RT	25.9	NED
66	T2N2	LTBR II + RT	29.8	LNED
79	T4N0	LTBR III + RT	36.5	DOD
84	T2N0	LTBR II	47.8	DOC
51	T2N0	LTBR II + RT	69.8	NED
75	T4N0	TTBR + RT	105.5	NED
45	T3N0	TTBR + RT	170.3	NED

LTBR, lateral temporal bone resection; LNED, patient lost without evidence of disease; DOC, died of other causes; DOD, died of disease; RT, postoperative radiotherapy; TTBR, total temporal bone resection; QT, chemotherapy; STTBR, subtotal temporal bone resection; NED, no evidence of disease.

edema and brainstem infarction; this patient died in the early postoperative period.

The 5-year disease free survival in our series has been 37% (Fig. 1). The disease free survival for stage II was 100%, for stage III 25%, and for stage IV 16%.

Nine patients died during the study, two who received palliation only because their tumors were inoperable, four due to local or regional recurrence, and three of distant metastasis and locoregional recurrence. Of these patients, 60% died during the first year after the surgery and another 25% died during the second year. Two patients died of other causes and two patients were lost without evidence of disease. The mean follow-up time of the censored patients was 20 months.

Six patients (31.2%) presented positive nodes, and all except for a lost patient have died of the disease 2 years after surgery. The 5-year survival

Figure 1 Chart shows 5-year overall survival of the series.

rate in N0 patients was 61%, whereas in N+ patients it was 0% (statistically significant difference; $p = 0.006$) (Fig. 2).

Four patients had facial palsy at presentation. Survival rate in this group of patients (0%) was significantly lower than in the rest of the patients (47%) ($p = 0.007$) (Fig. 3). Finally, only one of the

Figure 2 Chart shows disease-free survival of N0 and N+ patients ($p = 0.006$).

Figure 3 Chart shows facial palsy at presentation ($p = 0.007$).

three patients with intracranial extension remains alive free of disease 7 months after surgery.

Ten patients had well-differentiated tumors, six patients had moderately differentiated tumors, and three patients had poorly differentiated tumors. Well-differentiated tumors did not show significant longer survival (51%) than moderately or poorly differentiated tumors (0%) ($p = 0.07$) (Fig. 4).

Figure 4 Chart shows disease-free survival of poor versus moderate or well-differentiated tumors ($p = 0.07$).

DISCUSSION

If we consider the demographic variables of our series we find a slight predominance of men, which agrees with other published series, although in larger revisions a clear predominance of sex has not been observed.^{1,4,10,17} Among the predisposing factors the most important in our series is the antecedents of previous head and neck radiotherapy for nasopharyngeal cancer or skin neoplasms in seven patients.

SCC generally have a more aggressive behavior and a worse prognosis than other tumors of the auditory canal and middle ear. The overall 5-year survival for the entire series has been 37%, and for stage IV tumors 16%. The overall cure rate varied in different reports from 43.2 to 66.8%, and survival for stage IV disease from 0 to 34.3%.^{3,7,9-11}

Local recurrence and distant metastasis were recognized in 37% and 16% of patients, respectively, lower rates than those found in other series, although higher rates of recurrence have also been reported.^{3,11}

Of the patients who have died 44.4% had local recurrence, and 33.3% died of distant metastasis besides locoregional recurrence. Two patients (22.2%) died of inoperable tumors.

The therapeutic protocols have been evolving over the last several years, although surgery is still the key when facing this type of tumor. The surgical technique is well standardized by Medina and others.¹⁶ The aim is a complete removal of the tumor with free margins (that for large tumors may be accomplished in a piecemeal manner), followed by postoperative radiotherapy. We consider that SCC that invades the carotid or with evident middle or posterior fossa invasion is unresectable.

Lymph node metastasis at surgery was found in 16% of patients in our series, similar to other reports.⁹⁻¹¹ Due to the possibility of node metastasis in a 10 to 20% of the patients, it seems justified to perform a supraomohyoid or functional neck dissection. A superficial parotidectomy also seems reasonable given the low added morbidity, although we have only performed a parotidectomy

in patients with suspected clinical or radiological extension of the tumor to the parotid gland, or in the case of parotid node metastasis. Choi and colleagues¹⁸ found parotid node metastasis in only 2 cases out of 12 with EAC SCC, both in advanced stages.

The most recent papers recommend the use of postoperative radiotherapy in all cases, with better results when the resection margins have been negative.¹⁹ In our series we have not found significant differences, although a tendency toward a better survival rate was found in the group treated with surgery and radiotherapy, compared with the group treated only with surgery in stages III and IV. Some authors propose chemotherapy for stages III and IV.¹⁰ Complementary therapy with topical 5-fluorouracil cream application has also been studied.²⁰

Most important unfavorable prognostic factors were the presence of neck node metastasis and the presence of facial palsy at the diagnosis, both of them statistically significant. These results corroborate those reported in other papers.^{2,3,7,9-11} Facial palsy at presentation was an ominous sign in our study as all patients died within 16 months after surgery. Facial nerve involvement could modify the tumor stage as Hirsch²¹ first recommended. Dural involvement and degree of differentiation did not predict a worse outcome in our study, but the number of patients with dural involvement or undifferentiated tumors was too small to obtain reliable results.

We could not find a statistically significant difference when we compared tumors of different stages. There were only three patients in stage II. Two of them died of unrelated causes (brainstem infarction 4 months after surgery and gastric carcinoma 48 months after surgery), and the third is alive free of disease 70 months after surgery. The small number of patients in stage II precluded meaningful statistical analysis.

When the initial removal of the tumor is inadequate, survival rates fall dramatically. Moffat et al⁹ found better survival in patients treated de novo than in those who were referred from other institutions, possibly due to the fact that the latter

presented with more aggressive tumors or because radical surgery was not performed initially. In our series this same tendency was observed in patients with stage IV: those who underwent a total temporal resection showed the longest survival (105 and 170 mo).

Malignant tumors of the EAC and middle ear are rare, but are associated with high morbidity and mortality rates. SCC is the most frequent histologic type, arising mainly in the auditory canal rather than in the middle ear.

These tumors are diagnosed in a late stage most of the time because initial symptoms are similar to those of other (benign) diseases. In addition, there is a lack of clear anatomical barriers that prevent tumor progression. Prognosis depends on the tumor stage, the presence of positive nodes, facial paralysis, or intracranial extension with invasion of the dura.

Treatment of EAC carcinomas is generally based on the combination of surgery and radiotherapy. Patients with EAC must initially be treated radically, and for them, early diagnosis and referral to an institution with experience in this kind of surgery is important. In addition to postoperative treatment with radiotherapy, it seems advisable to evaluate the response to different lines of chemotherapy used in SCC of the head and neck. This is especially important for tumors in advanced stages that present with features associated with poor prognosis, due to the short life expectancy under these circumstances given current treatments.

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