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Adenoid cystic carcinoma of the external ear: a population based study☆,☆☆

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ABSTRACT

Purpose: To determine the incidence of adenoid cystic carcinoma of the external ear in the United States, and to evaluate the clinical characteristics and survival outcomes associated with the disease.
Materials and Methods: Data were extracted from the Surveillance, Epidemiology, and End Results (SEER) 18 Database of the National Cancer Institute. The study cohort included patients diagnosed with adenoid cystic carcinoma of the external ear from 1973 to 2012.
Results: The incidence of adenoid cystic carcinoma of the external ear was 0.004 per 100,000. The SEER database identified 66 patients meeting the inclusion criteria. Nodal metastasis was noted in 13.1% of patients, while 7.9% had distant metastasis. Distant metastasis was associated with worse overall survival (HR 10.18). However, nodal metastasis had no impact on overall survival (HR 0.15, p = 0.09). Surgery alone was associated with improved overall survival (HR 0.26), compared with combination surgery and radiotherapy, while radiotherapy alone was associated with worse overall survival (HR 20.12). Increasing age (HR 1.12) and black race (HR 6.83) were associated with worse overall survival, while female sex (HR 0.26) was associated with improved overall survival.
Conclusion: ACC of the external ear is rare. Distant metastasis is a poor prognostic factor. However, nodal metastasis does not appear to impact survival. Advanced age, black race, and male sex are also poor prognostic factors. Surgical resection alone is associated with better survival than combination surgical resection and radiation, or radiotherapy alone.

1. Introduction

Adenoid cystic carcinoma (ACC) is a high-grade malignancy that is associated with dismal outcomes, with several studies citing long-term fatal outcomes ranging from 60% to 90% [1,2]. ACC consists of ductal and basal/myoepithelial cells that are usually found in a glandular, or cribriform, pattern [3]. The estimated incidence is 1.0/100,000 per year, and represents approximately 10% of all epithelial secretory cell neoplasms [4]. ACC is most commonly found in the salivary glands, accounting for 22% of all salivary gland malignancies [5]. However, ACC can also be found in other organs, including the nasal cavity, the intraosseous mandible or maxilla, esophagus, larynx, trachea, lacrimal gland, breast, lungs, and external auditory canal [4–9].

Cancers of the external ear are rare and represent a small percentage of head and neck cancers. Tumors of the external auditory canal (EAC) are exceedingly rare and represent approximately 0.2% of all head and neck cancers [10]. A

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retrospective single-center study reviewing charts from 1991 to 2011 noted that, by type, 70% of EAC cancers were squamous cell carcinoma, while 10% were ACC and another 10% were neuroendocrine tumors [11]. ACC presents a unique challenge for physicians given its propensity for recurrence [12].

Very few cases of ACC of the EAC have been reported in the English literature. [12]. Given how rare the tumor is, the sample sizes have been limited in most studies, and the literature is thus sparse in this area. The purpose of this study is thus to determine the incidence of ACC of the external ear in the United States, and to evaluate the clinical characteristics and survival outcomes of patients with ACC of the external ear using a large, population-based cancer database.

2. Methods

Data were extracted from the Surveillance, Epidemiology, and End Results (SEER) 18 Database of the National Cancer Institute, which includes data obtained from 18 population-based registries. Seven registries (Connecticut, Detroit, Hawaii, Iowa, New Mexico, San Francisco-Oakland, and Utah) joined the SEER program in 1973; 2 registries (Seattle-Puget Sound and Atlanta) joined in 1974 and 1975, respectively; 4 registries (Los Angeles, San Jose-Monterey, Rural Georgia, and the Alaska Native Tumor Registry) joined in 1992; 5 registries (Greater California, Kentucky, Louisiana, New Jersey, and Greater Georgia) joined in 2000 [13].

The study cohort included patients diagnosed with adenoid cystic carcinoma of the external ear from 1973 to 2012. The following International Classification of Diseases for Oncology (ICD-O) code was used: C44.2 for external ear. The following ICD-O histology codes were used: 8200/3: Adenoid cystic carcinoma, and 8201/3: Cribriform carcinoma. Race was recorded in the SEER database as "White"; "Black"; "Other: American Indian, AK Native, Asian/Pacific Islander"; or "Unknown". Marital status was grouped as: "married" (including common law) or "single" (single- never married, divorced, widowed). Therapy was coded as: none, surgery, surgery with radiotherapy, and radiotherapy alone.

The SEER computer software (SEER*Stat 8.1.5) was used to extract data from the SEER database and to compute disease incidence. IBM SPSS version 20 was used for statistical analysis. Survival analysis was performed using Kaplan–Meier analysis. The outcome measures were overall and disease-specific cumulative survival. Cox proportional hazards regression model was used for multivariable survival analysis. Race, sex, age, year of diagnosis, nodal metastasis, distant metastasis, and mode of therapy were entered a priori into the model. P value <0.05 was considered statistically significant. This study was exempt from the Icahn School of Medicine at Mount Sinai Institutional Review Board review because it was conducted using de-identified public data.

3. Results

3.1. Incidence and patient characteristics

From 1973 to 2012, the SEER database identified a total of 66 patients meeting the inclusion criteria. The incidence of adenoid cystic carcinoma of the external ear was 0.004 per 100,000. The patients' ages ranged from 22 years to 96 years (mean age 59.2 years, median age 59 years). Forty patients (60.6%) were female. Fifty-three patients (80.3%) were white, 5 patients (7.6%) were black, and 5 (7.6%) were classified as "Other." The remainder were of unknown race. Of the 61 patients with data on nodal status, 8 (13.1%) had nodal metastasis. Of the 63 patients with data on presence or absence of distant metastasis, 5 (7.9%) had distant metastasis. One patient received no cancer-directed therapy. Thirty-one patients (47%) were treated with surgical therapy alone, 25 (37.9%) received surgery with radiotherapy, and 5 (7.6%) were treated with radiotherapy alone. Four patients were missing information on mode of therapy.

3.2. Survival outcomes

The 5-year overall survival (OS) was 84% (Fig. 1). Results of univariable analysis are shown in Table 1. Patients with distant metastasis had worse OS than patients without ($p < 0.001$). After excluding patients with distant metastasis, patients with nodal metastasis had worse OS than patients without ($p = 0.03$). The sample size within each therapy group was insufficient to compare OS between therapeutic modalities.

Results of multivariable analysis are shown in Table 2. Distant metastasis was associated with worse OS (HR 10.18). Nodal metastasis had no impact on OS (HR 0.15, $p = 0.09$). Compared with combined therapy with surgery and radiotherapy, surgery alone was associated with improved OS (HR 0.26), while radiotherapy alone was associated with worse OS (HR 20.12). Increasing age (HR 1.12) and black race (HR 6.83) were associated with worse OS, while female sex (HR 0.26) was associated with improved OS.

4. Discussion

The results of our study showed that ACC of the external ear is a rare disease. Patients with localized disease had good

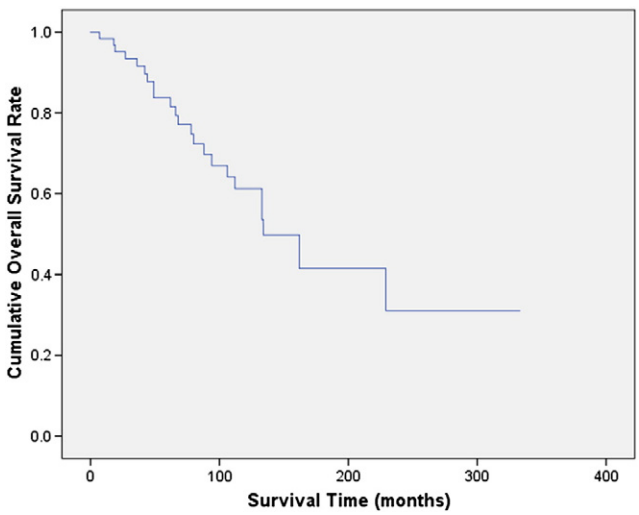

Fig. 1 – Overall cumulative survival for patients with adenoid cystic carcinoma of the external ear.