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Metastatic salivary ductal carcinoma to the mastoid segment of the facial nerve

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Abstract

Objective—To describe salivary ductal carcinoma (SDC) presenting as an isolated lesion of the mastoid segment of the facial nerve

Patients—A 70-year-old man presenting with weakness of his right lower lip that progressed to complete facial paralysis over a span of two weeks.

Main Outcome Measures—Clinical case records, immunohistochemical analyses, and radiological analyses including magnetic resonance imaging (MRI) and positron emission tomography–computed tomography (PET/CT).

Results—Nodular enhancement along the mastoid segment of the facial nerve was identified without any mass within the parotid on MRI or regional/distant disease on PET/CT. Pathologic analysis of tissue obtained from a right parotidectomy, neck dissection, and transmastoid resection of the vertical segment of the facial nerve revealed a benign parotid gland with malignant glands identified intra- and perineurally within the central aspect of the gland.

Conclusions—SDC is one of the most aggressive salivary malignancies and typically presents as a rapidly enlarging mass in the involved gland. Although SDC's clinical course is characterized by early metastasis, isolated neural invasion has not been reported in the absence of an identifiable primary tumor within the gland of origin. The present case illustrates the clinical history and treatment of the first case of a SDC presenting as an isolated facial nerve lesion from perineural spread.

Keywords

Facial nerve; facial paralysis; skull base; mastoid; salivary gland neoplasms; parotid neoplasms; salivary ductal carcinoma

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Conflict of Interest:

All authors have indicated they have no potential conflicts of interest to disclose.

INTRODUCTION

Salivary duct carcinoma (SDC), named for its histologic similarity to high-grade ductal carcinoma of the breast,^{1,2} is one of the most aggressive malignancies originating from the salivary glands, with a 5 year survival rate less than 40 percent.^{3,4} We present the first case report of a SDC presenting as an isolated facial nerve lesion from perineural spread from the parotid gland.

CASE REPORT

A 70-year-old man with a past medical history of renal cell carcinoma presented with progressive unilateral facial paralysis. Symptoms started with weakness of his right lower lip and progressed to complete facial paralysis over a span of two weeks. A head MRI was obtained at an outside institution. The report of which was normal with no facial nerve or parotid lesion. He presented to the Medical University of South Carolina for a second opinion. Examination revealed severe facial paralysis (Sunnybrook Facial Grading score: 5, House-Brackmann Scale: V) with synkinesis and very slight movement of the labial depressors and platysma. No motion was noted in the upper or mid face.

Upon review of the MRI at our institution, a vague abnormality of the facial nerve was noted on the previous MRI. A repeat MRI of the temporal bone revealed a 7×4×4 mm nodular enhancement along the mastoid segment of the right facial nerve. No masses or lesions were noted in the parotid gland. Given the subacute onset of paralysis, the patient's history of renal cell cancer, and the lesion seen on MRI, the decision was made to biopsy the lesion. Biopsy was obtained through a transmastoid approach and performed by shaving a tumor specimen off the nerve. Intraoperative frozen pathology results were inconclusive. Final pathology demonstrated metastatic carcinoma invading the facial nerve with irregular nests of malignant cells with large, atypical nuclei, and prominent nucleoli on histology. Immunohistochemical stains performed to characterize the lesion showed pankeratin (AE1/AE3) and cytokeratin 7 positivity. Malignant cells were negative for Pax 8 (present in 90% of renal cell carcinomas), Sox10 and Mart1 (melanoma markers), and cytokeratin 5/6 and p40 (squamous cell carcinoma markers). Overall, the staining pattern was nonspecific but would be compatible with a carcinoma from salivary, thyroid, lung, pancreaticobiliary, or upper gastrointestinal primary.

A subsequent whole-body PET/CT scan did not demonstrate any regional or distant disease. Given the confirmed diagnosis of cancer the patient was taken to the operating room for a multidisciplinary procedure including a right parotidectomy and neck dissection, and transmastoid resection of the vertical segment of the facial nerve was undertaken to completely resect the sole focus of identifiable tumor. The resection margin was just distal to the second genu. The frozen section was taken at the second genu with additional nerve proximal to the frozen section site sent for permanent. Margins were cleared and a facial nerve reanimation was performed with bilateral brow lifts and upper blepharoplasty, right eyelid weight placement and lateral canthoplasty, right nasal valve suspension, right facial suspension with fascia lata, masseter to facial nerve transfer and fat grafting. The patient recovered well from surgery and was discharged home on day 3. While the resection

specimen did not demonstrate grossly palpable tumor within the parotid gland, histologic analysis demonstrated malignant glands intra- and perineurally within the central aspect of the parotid gland. The tumor formed rounded cystic structures with comedo necrosis and numerous mitoses, morphologically compatible with a salivary duct carcinoma. The immunohistochemical profile was cytokeratin 7 and androgen receptor positive. Her2/neu staining demonstrated complete, uniform, membrane staining. The final stage was T4N0M0. The patient underwent adjuvant intensity modulated radiation therapy (IMRT) to the parotid bed and is currently without evidence of disease at 6 months follow up.

DISCUSSION

This is the first reported case of SDC diagnosed as a lesion involving the mastoid segment of the facial nerve with a normal appearing parotid gland. SDC is an uncommon malignancy that may be misdiagnosed as high-grade mucoepidermoid carcinoma (MEC).⁵ The tumor represents approximately 9% of all salivary malignancies and mostly occurs within the parotid gland.^{4,6} SDC is an aggressive adenocarcinoma and its clinical course is characterized by early distant metastasis or local recurrence, with >60% of patients dying of the disease within 5 years of diagnosis regardless of stage.^{3,4}

Most patients diagnosed with SDC present with a rapidly enlarging mass, and up to 25% of cases involve the facial nerve.⁷ Vascular, infectious, or autoimmune causes of cranial nerve deficits rarely present as isolated unilateral facial paralysis; however, neoplastic infiltration or compression of the facial nerve may be confused for Bell's palsy. Despite the absence of any parotid mass, the patient's gradual onset of neurologic symptoms over 2 weeks and slight recovery and synkinesis of only the lip depressors and platysma did not fit the typical pattern of Bell's palsy. Slowly progressive and persistent facial weakness or paralysis that is more pronounced along specific branches of the facial nerve raise concern for an occult malignancy. Tumors may also cause pain from compression of local structures, and depending on location, multiple cranial nerve deficits may be observed. With Bell's palsy, viral inflammation characteristically results in enhancement of multiple segments of the facial nerve on MR imaging, while focal enlargement or enhancement of the nerve is more common with malignancies.⁸ However, as in this case, imaging may initially not demonstrate a clear lesion of the facial nerve despite paralysis.

The immunohistochemical profile of SDC includes pancytokeratin, cytokeratin 7, carcinoembryonic antigen, and strong nuclear reactivity for androgen receptors (AR).^{4,9} AR positivity is observed in >90% of cases,⁴ and is highly specific in distinguishing SDC from mucoepidermoid carcinoma.⁵ As with invasive ductal carcinoma of the breast, Her2/neu may be positive in SDC. Her2/neu overexpression and amplification is a poor prognostic indicator and detected in one third of cases.¹⁰ SDCs rarely stain positive for estrogen or progesterone receptors, which separates the disease from breast ductal carcinoma metastases.² Other mutations implicated in SDC include TP53 (56%), loss of PTEN (38%), HRAS (34%), PIK3CA (33%), and BRAF V600E kinase (7%).^{10–12} In addition to improved diagnosis and prognostication, detection of genetic biomarkers may expand the therapeutic options for SDC. Cytotoxic chemotherapy is relegated mainly to palliation of advanced or metastatic disease due to limited efficacy. Therapy targeted to

SDC's molecular mutations is a major ambition in the treatment of SDC given its overall poor prognosis.

CONCLUSION

This case demonstrates the ability of SDC to spread perineurally even without a clear lesion in the gland of origin. Although neoplastic invasion remains a rare cause of facial palsy, close evaluation of imaging and early suspicion for occult malignancy are warranted when facial nerve paralysis is not acute.

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Figure 1.
Initial T1 contrasted coronal MRI demonstrating a vague abnormality of the facial nerve.

Figure 2.

(A) T1 contrasted axial MRI demonstrating an enhancing 7×4×4 mm lesion of the mastoid segment of the facial nerve near the jugular bulb. (B) T1 contrasted coronal MRI also demonstrating the lesion of the mastoid segment of the facial nerve and its proximity to the jugular bulb. No other lesions were appreciated within the parotid gland.

Figure 3.

(A) Hematoxylin and eosin stained sections of the parotid gland (open arrow) demonstrated an aggressive tumor within a central neurovascular bundle. The basophilic glands had prominent perineural invasion (arrow). (B) In addition to the broad areas of necrosis, the malignant glands also demonstrated central comedo-type necrosis (*). (C) The tumor cells exhibited strong nuclear positivity for androgen receptor, characteristic of salivary duct carcinoma. (D) Additionally, an immunohistochemical stain for Her2/neu showed strong, uniform membrane positivity in the majority of cells.