Case Report

Concurrent occurrence of squamous cell carcinoma in a cerebellopontine angle epidermoid cyst: A case report and review of the literature

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INTRODUCTION

Intracranial epidermoid cysts (IECs) are extra-axial, usually congenital lesions that arise from trapped epithelium during gestation.¹² IECs most commonly present during early adulthood, with a peak incidence in the fourth decade.¹¹,¹² Rarely, IEC may occur as a result of traumatic inoculation from a prior surgical procedure or trauma.¹⁸,¹³ Congenitally, they are most commonly located in the posterior fossa, with a predilection for the CPA cistern,¹¹² representing approximately 7% of tumors in this location, and about 1% of intracranial tumors overall.¹⁷,¹⁰ They are considered to be benign, with linear growth as a result of a progressive epithelium desquamation.¹⁸,¹¹²

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IECs typically cause symptoms resulting from local mass effect on surrounding neural structures. In rare cases, the epithelium lining of the cyst can undergo malignant transformation (MT) into squamous cell carcinoma (SCC), which occurs predominantly in the fourth and fifth decades of life.[1-4,7,10,14,15,18] The reasons for MT are unclear but probably relate to the chronic inflammation caused by the contents of the IEC, which leads to cellular dysplasia and eventually neoplasia.[1,10] The concurrent occurrence of SCC has also been described in epidermoid cysts (ECs) located extracranially.[6] MT presents with rapid clinical or radiological progression.[10] In addition, MT should be considered in patients who show rapid recurrence of tumor or when the tumor demonstrates enhancement.[10]

We present the case of a 61-year-old male diagnosed with a concurrent CPA IEC and SCC.

**CASE PRESENTATION**

A 61-year-old male patient presented to our clinic with several weeks of episodic vertigo, diplopia, and right trigeminal (CN V2) hypoesthesia. A magnetic resonance imaging (MRI) examination showed an extra-axial lobulated mass, measuring 22 × 25 × 35 mm, in the right CPA, causing significant pressure on the adjacent cerebellar lobe and brainstem, although, without hydrocephalus. The lesion demonstrated characteristic radiological features consistent with an EC, including hypointensity on T1-weighted image (T1WI), hyperintensity on T2-weighted image (T2WI) with some T2 hypointensities areas in the anterior-medial periphery, correlating with keratin, and restriction on diffusion-weighted image (DWI). A small enhancing region was present on the medial side of the lesion [Figure 1]. Due to typical and characteristic location and radiological features, with only small partial patchy enhancement, the differential diagnoses of infective lesion or other cellular malignancy were possible, although small, and the probability of EC with MT was high on the differential diagnosis list.

A right retrosigmoid suboccipital craniotomy was done with electrophysiological monitoring including electromyography of CN 5, 7, as well as brainstem auditory-evoked response, in addition to transcranial motor-evoked potential monitoring and somatosensory-evoked potentials. During surgery, two different tissue pathologies were observed, one consistent with a typical epidermoid tumor, for which a near gross total resection (GTR) was achieved, which could be evident on a postoperative MRI. In addition, a different tissue with firm consistency was recognized that was adherent to the brainstem, preventing GTR, leaving the small enhancing region on the medial side of the lesion as seen on the postoperative MRI.

The pathological evaluation confirmed the presence of two separate histologies. The first specimen demonstrated areas of simple squamous epithelial cyst with mounds of layered keratin, typical of EC [Figure 2]. The other specimen contained thickened, proliferating squamous epithelium creating finger-like projections, and containing dyskeratotic and acantholytic cells and foci of necrosis, compatible with SCC [Figure 3]. Beta-catenin and BRAF V600E were negative, ruling out a craniopharyngioma.

The patient was recommended radiotherapy, yet for unknown reasons, he never showed up for treatment. Eleven months following surgical resection, a follow-up MRI showed a local massive recurrence of the enhancing lesion [Figure 4]. After a multidisciplinary discussion, and understanding that the tumor was not amendable for GTR without significant morbidity, the patient was re-referred to radiation therapy. An MRI scan done 2 months after radiation therapy showed a decrease in the size of the recurring lesion [Figure 4]. At present, he is being followed up and is expected to continue periodical clinical and radiological investigations.

**DISCUSSION**

The occurrence of SCC intracranially is usually a result of metastases or direct extension from a primary location of squamous epithelial cyst with mounds of layered keratin, typical of EC [Figure 2]. The other specimen contained thickened, proliferating squamous epithelium creating finger-like projections, and containing dyskeratotic and acantholytic cells and foci of necrosis, compatible with SCC [Figure 3]. Beta-catenin and BRAF V600E were negative, ruling out a craniopharyngioma.

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**DISCUSSION**

The occurrence of SCC intracranially is usually a result of metastases or direct extension from a primary location
Gabay, et al.: Co-occurrence of SCC in intracranial epidermoid cyst

The primary SCC is extremely rare and is usually the result of MT of benign IEC. Originally, Garcia et al. published four criteria that should be fulfilled to define a true intracranial MT into SCC. Later, Hamlat et al. added two more criteria, providing six criteria that need to be satisfied before diagnosing primary intracranial SCC. Hamlat et al. further, subclassified intracranial SCC into five different types, including (1) initial MT of an IEC; (2) MT from a remnant IEC; (3) MT with leptomeningeal carcinomatosis; (4) SCC arising from other benign cysts; and (5) other malignancies arising from benign cysts. Accordingly, our case is classified as an initial MT of an IEC (Type 1).

Preoperative diagnosis of MT of an IEC, based on radiological features, is challenging, and ultimately, a definite diagnosis depends on histopathological examination. IECs typically have characteristic radiological features, specifically low-signal intensity on T1WI and high-signal intensity on T2WI, as well as strong restriction on DWI. Rarely, they can present with high signal on T1WI imaging, either due to hemorrhage into the lesion cavity or as a result of high protein or lipid content (known as “white IEC”). Typically, IECs are not enhancing lesions or only rarely demonstrate any enhancement of the wall. In cases of MT, enhancement becomes more vividly pronounced. In our case, the lesion had a small enhancing area adjacent to the brainstem that was seen on the preoperative MRI and that was later shown to be the SCC component of the tumor.

There is a surgical advantage to preoperatively acknowledging that these two pathologies can coexist, for two main reasons – the first for biopsy, as in our case,

Figure 2: Demonstrating areas of a simple squamous epithelial cyst with mounds of layered keratin, typical of an epidermoid cyst (H&E stained, ×50).

Figure 3: Demonstrating areas of proliferating squamous epithelium with thick projections (upper; H&E stained, ×50); and areas of MT demonstrating dyskeratotic cells, few mitotic figures (red circled), and necrosis (lower; H&E stained, ×100).

Figure 4: Magnetic resonance imaging (MRI) T1 + c – axial view – postoperative MRI 11 months following surgical resection demonstrating local massive recurrence (left); and MRI 2 months following radiation therapy (right) demonstrating a decrease in the size of the lesion.
Table 1: Criteria for diagnosis of primary squamous cell carcinoma.

| Garcia’s et al. criteria, 1981[7] |
|-----------------------------------|
| 1. Tumor restricted to the intracranial intradural compartment |
| 2. No evidence of invasion or extension beyond the dura, cranial bones, or through cranial orifices |
| 3. No communication with the middle ear, air sinuses, or sella turcica |
| 4. No evidence of a nasopharyngeal tumor |
| 5. Presence of benign squamous epithelium within the main tumor mass |
| 6. Exclusion of primary SCC elsewhere |

where there were two different tissue consistencies, and the second, for the intended extent of resection. While extensive surgical resection aiming for GTR is currently the gold standard for the treatment of IECs, there is no defined standard of care for IECs undergoing MT.[1,3,4,16,17] Surgery alone is not curative and is most often limited due to the firmly adherent nature of the malignant component to vital neurovascular structures, as was in our case. The addition of adjuvant radiation therapy offers some improvement in short-term survival, with Gamma-Knife radiosurgery showing the most promising results.[16,17] However, the exact radiotherapy protocol has yet to be determined, and a large analysis done by Nagasawa et al. who showed no significant correlation between the dose of radiation and survival outcome.[16]

CONCLUSION

Intracranial SCCs are rare and aggressive tumors. The possibility of MT of an IEC should be always be considered and kept in the surgeon's mind when approaching to resect such lesions. Preoperatively, MT should be suspected by rapid deterioration of symptoms and signs and aggressive radiological course. The co-occurrence of SCC and IEC is a rare and devastating event, changing the course of the disease. Separate pathological specimens should be sent from any visually distinguishing pathological tissue. Radiotherapy should be supplemented in cases of SCC. In addition, surgical resection should strive for GTR of IEC whenever possible, without compromising vital neurological functions. Postoperatively, a close clinical and imaging follow-up is recommended for any subtotally resected IEC.

Declaration of patient consent

Patient's consent not required as patient's identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest

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