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Facial nerve dysfunction associated with cystic lesions of the mastoid

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The differential diagnosis of facial nerve dysfunction includes a broad array of temporal bone pathologic conditions. We present two cases of facial nerve dysfunction attributable to benign cystic lesions of the mastoid: one, a patient with a mastoid mucocele presenting with facial twitch; and the second, a patient with a mastoid cholesterol granuloma presenting as recurrent facial palsy. MRI and CT of the temporal bone provided a radiologic diagnosis for both patients. The facial nerve symptoms in each case responded well to surgical intervention.

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CASE REPORTS

Case 1. A 24-year-old woman presented with a 6-month history of left hemifacial twitch. Her twitching episodes occurred several times per day, with increasing frequency and intensity of her symptoms. She also reported a 1-month history of "burning" dysgeusia and intermittent left mastoid otalgia. She noted no facial weakness and no changes in hearing. Her medical history was unremarkable. The results of a physical examination were notable for normal ears bilaterally and the results of a cranial nerve examination were normal, with the facial nerve graded 1/6 on the House-Brackmann scale. An audiogram showed normal hearing thresholds and normal acoustic reflexes.

An MRI scan of the temporal bone was obtained without and with gadolinium enhancement. A 1.5×1.5 cm mass was identified deep in the left mastoid, adjacent to the vertical segment of the facial nerve. The mass demonstrated hypointense (relative to brain) T_1-weighted signal and hyperintense T_2-weighted signal (Fig. 1*A* and *B*), with no enhancement of either the facial nerve or the mastoid mass on postgadolinium images. A CT scan demonstrated the mastoid

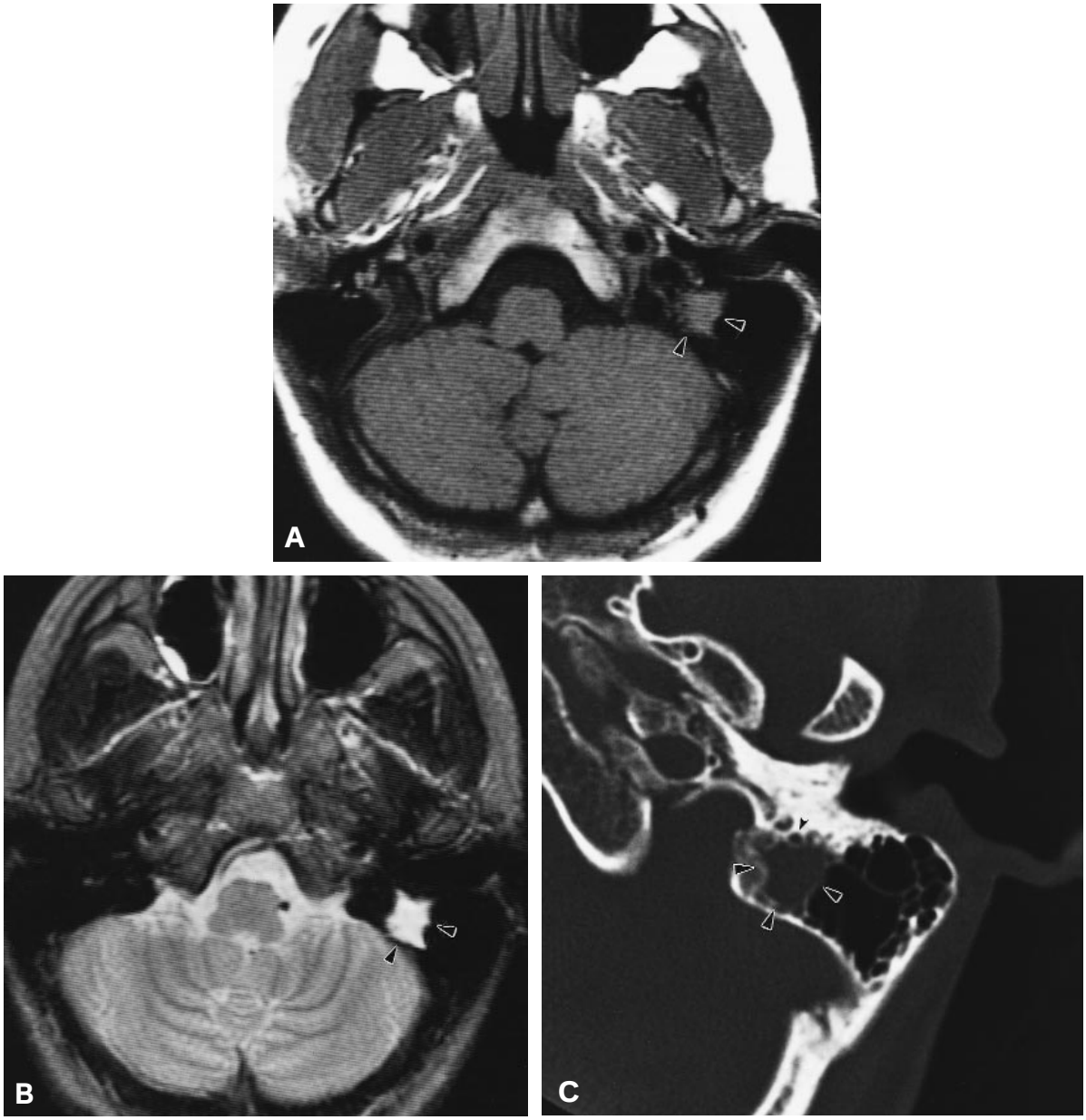

Fig. 1 A, T_1-weighted pregadolinium MRI depicting isointense left mastoid lesion (*arrows*). **B,** T_2-weighted pregadolinium MRI of same lesion (*arrows*) demonstrating hyperintense signal intensity. **C,** Temporal bone CT scan demonstrating mastoid lesion (*outlined arrows*) abutting fallopian canal (*smaller solid arrow*).

lesion abutting the fallopian canal, without evidence of significant erosive bony changes (Fig. 1*C*).

The patient underwent intact-canal wall mastoidectomy with intraoperative facial nerve monitoring. A mastoid mucocele was identified near the mastoid tip, adjacent to the vertical segment of the facial nerve. The cyst cavity contained clear, straw-colored fluid. A dehiscent portion of the facial nerve was visible within the cavity, but the facial nerve was otherwise normal in appearance. The mucocele was then drained and exteriorized.

Postoperatively, the patient showed rapid resolution of her facial nerve symptoms. Both her twitching and her dysgeusia resolved 7 days after the operation. A bacterial culture taken intraoperatively of the cyst fluid showed no growth. A pathologic examination confirmed the intraoperative diagnosis of mucocele. The patient had an uneventful postoperative

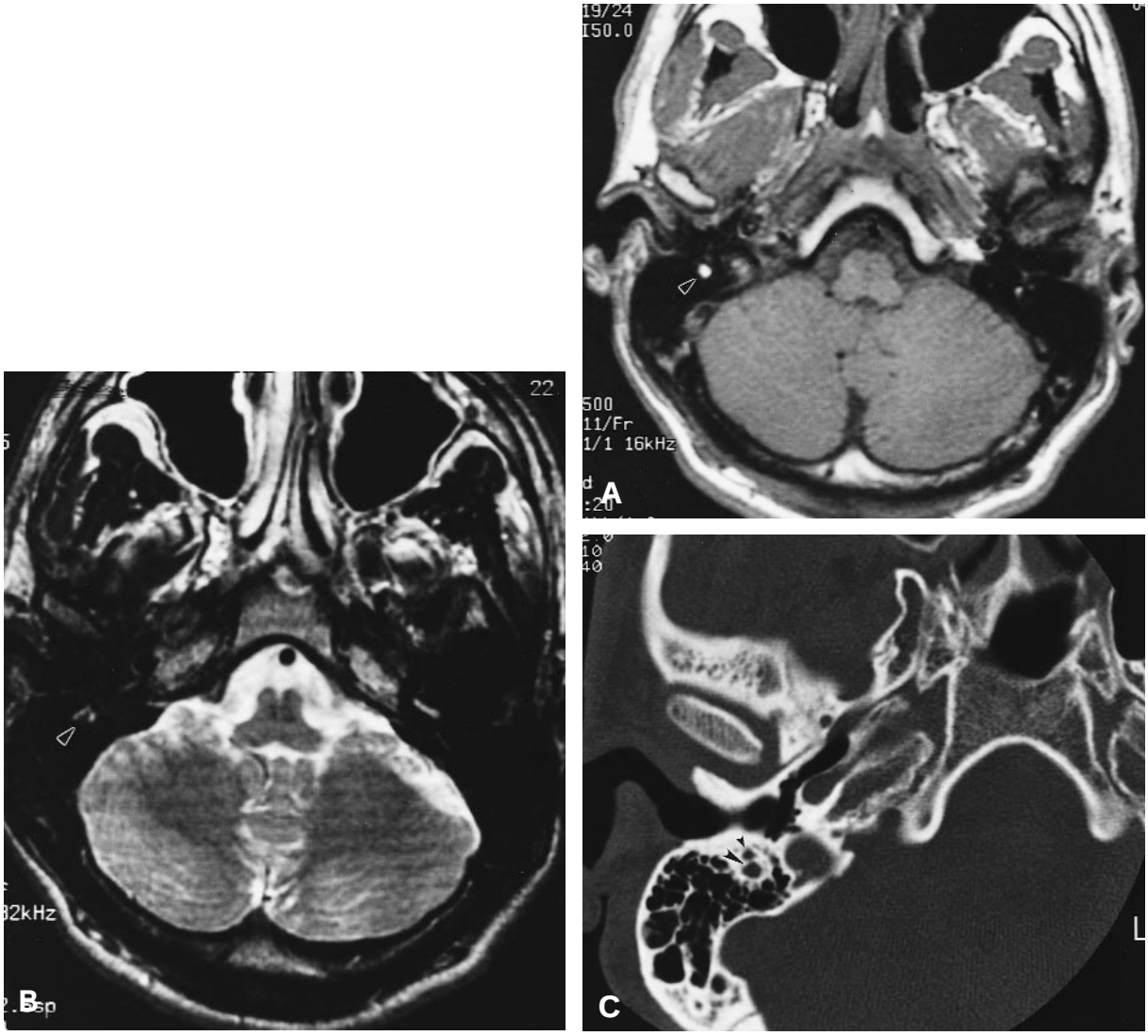

Fig. 2. A, T_1-weighted pregadolinium MRI showing focal hyperintense right mastoid lesion (*arrow*). **B,** T_2-weighted image depicting same lesion (*arrow*). **C,** Temporal bone CT scan showing mastoid mucocele (*large arrow*) just posterior to fallopian canal (*small arrow*). Note erosive changes of bony partition between the two structures.

Table 1. Indications for gadolinium-enhanced MRI in patients with facial nerve dysfunction

Slowly progressive facial palsy
Hyperfunction (spasm)
Palsy lasting > 2 months
Recurrent palsy
Dysfunction associated with an atypical degree of pain
Multiple cranial neuropathic conditions

course and remained symptom-free at 3 months postoperatively.

Case 2. A 22-year-old man presented with a recurrent right facial palsy. Five years earlier, the patient had first presented with a House-Brackmann grade 6/6 acute right facial palsy. His condition was managed conservatively at that time and he recovered to grade 1/6 facial function after 1 month. He had normal facial nerve function until the development of a recurrent grade 6/6 acute right facial palsy at the current presentation. He did notice some antecedent dysgeusia and a right-sided headache but no changes in hearing. His medical history was otherwise normal. A physical examination showed normal ears bilaterally. With the exception of the facial nerve, the remainder of the cranial nerves were intact. An audiogram showed normal hearing thresholds and normal acoustic reflexes.

The patient received a trial of oral prednisone, during which he showed improvement in facial nerve function to

Table 2. Radiographic characteristics of cystic lesions of the mastoid

Lesion	Bone erosion	Contrast enhancement	Pneumatization	T_1 intensity	T_2 intensity	Gadolinium enhancement
Cholesterol granuloma	–	–	Normal	Hyper	Hyper	–
Mucocele	–	–	Normal	Hypo	Hyper	–
Cholesteatoma	+	–	Often hypo	Hypo*	Hyper	–
Neoplasm	+	+	Normal	Hypo	Hyper	+

*In rare exceptions, cholesteatoma may have moderate to high T_1 signal intensity.

grade 3/6. After 2 months of observation, however, the patient failed to show further improvement in facial nerve function. Electroneurography was performed, showing 23% residual function of the right facial nerve and a normal left facial nerve.

An MRI scan of the temporal bone was then obtained, both without and with gadolinium enhancement. A 2×2 mm focal lesion was identified in the right mastoid adjacent to the vertical segment of the facial nerve. The mass showed hyperintense signals on both T_1-weighted and T_2-weighted images (Fig. 2*A* and *B*). The mass did not show gadolinium enhancement, although gadolinium enhancement of the vertical segment of the right facial nerve was evident. A high-resolution temporal bone CT scan revealed the same mastoid lesion directly adjacent to the fallopian canal with evidence of bony erosion of the partition between the facial nerve and mastoid lesion (Fig. 2*C*).

The patient underwent intact-canal wall mastoidectomy with intraoperative facial nerve monitoring. Intraoperatively, the mastoid lesion was identified as a cyst located just posterior to the vertical segment of the facial nerve. The cyst was filled with opaque dark brown fluid, consistent with cholesterol granuloma. The facial nerve was noted to be dehiscent into the cyst cavity, with the exposed nerve appearing edematous and inflamed. Given the intraoperative evidence of facial nerve edema, the vertical segment of the facial nerve was decompressed after marsupialization of the cyst.

Postoperatively, the facial nerve function of the patient improved from 3/6 to 2/6 after 10 days. A pathologic examination confirmed the diagnosis of cholesterol granuloma. At 3 month follow-up, the patient had regained 1/6 function of the right facial nerve.

DISCUSSION

Mucoceles of the temporal bone arise from the progressive inspissation of mucus within an obstructed air cell. Cholesterol granulomas presumably also develop from inadequately aerated air cells; they are characterized by a localized sterile inflammatory process involving foreign body giant cells and the deposition of hemosiderin and cholesterol crystals, which are by-products of hemorrhage and cellular degeneration. Both mucoceles and cholesterol granulomas are relatively uncommon entities in the mastoid.[1-3] Both entities may persist without symptoms for extended periods and in such instances would not require surgical intervention. A cholesterol granuloma or a mucocele, however, may expand to involve adjacent structures, thereby necessitating drainage. In a thorough review of the medical literature since 1966 (MEDLINE), we were unable to identify another reported case of cystic lesions of the mastoid presenting with facial nerve dysfunction.

In the cases presented, MRI provided critical diagnostic information regarding the cause of the facial nerve dysfunction. When obtained in the evaluation of facial nerve dysfunction, MRI should image the temporal bone, posterior cranial fossa, and parotid bed. Not all patients who present with facial palsy, however, need to undergo imaging. Our indications for the use of gadolinium-enhanced MRI in the setting of facial nerve dysfunction are summarized in Table 1. In the two current cases, MRI localized cryptic lesions in the mastoid air cells and suggested a specific diagnosis based on the signal properties of the lesion.

For example, in the case of the first patient, the isointense T_1-weighted signal of the lesion, its hyperintense T_2-weighted signal, and its nonenhancement with gadolinium narrowed the differential diagnosis considerably to either a mucocele or cholesteatoma.[4] CT imaging helped to narrow the diagnosis further. Whereas cholesteatoma would typically be associated with CT findings of bony erosion and hypopneumatization of the temporal bone,[5] the absence of such findings in this patient suggested a diagnosis of mucocele. In the second patient, the hyperintense signal seen on both the T_1- and T_2-weighted images was strongly indicative of cholesterol granuloma.[6] The differential diagnosis of cystic temporal bone lesions on the basis of MRI and CT imaging characteristics is summarized in Table 2.[7]

In symptomatic patients, both mucoceles and cholesterol granulomas may be managed definitively via surgical marsupialization. Because the pathogenesis of each lesion stems from obstruction of mastoid air cells, the goals of surgical intervention are to provide drainage and to re-establish aeration. When the lesion involves the petrous apex, as is relatively common with cholesterol granuloma, more complex infralabyrinthine, middle fossa, or trans-sphenoidal approaches may be required.[8] In the two cases presented, however, a simple mastoidectomy provided adequate exposure for surgical drainage.

In conclusion, MRI of the temporal bone may provide useful diagnostic information in selected patients with facial nerve dysfunction. When temporal bone lesions are identified, as in the cases presented, the MRI signal characteristics of the lesion provide reliable criteria for diagnosis. In addition, supplemental CT imaging of the temporal bone provides important complementary information through its superior bony detail.[9] A carefully planned radiologic evaluation can therefore provide critical data for appropriate diagnosis and treatment of unusual facial nerve disorders.

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