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A rare infectious presentation of a temporal bone meningioma

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To the Editor,

En plaque meningiomas of the temporal bone commonly have years of delay in diagnosis due to the chronic nature of the presenting symptoms, which include serous otitis media and aural fullness, and the lack of compressive symptoms seen with bulky mass tumors [1]. We present a rare case of an en plaque temporal bone meningioma with an acute and critical presentation secondary to infectious processes that were a direct result of local invasion. Bacterial meningitis, brain abscess, and mastoiditis with secondary septic thrombosis were the salient presenting features in this case. This presentation is very atypical of temporal bone meningiomas, but failure to recognize these associations can result in missed diagnosis in critically-ill patients.

Clinical presentation

A 35-year-old woman presented three months post-partum with bacterial meningitis and mastoiditis. During her pregnancy she had multiple bouts of left sided otalgia and hearing loss. A non-enhanced temporal bone CT showed opacification of the entire left middle ear cavity, and mastoid air cells with focal bony dehiscence of the mastoid. There was erosion of the scutum on the left side and thickening and opacification of the tegmen tympani (Fig. 1a). She was found to have a mass at the mastoid and middle ear on cortical mastoidectomy. Blood cultures grew *Streptococcus pneumoniae*; cerebrospinal fluid cultures were negative. She developed increased intracranial pressure from septic thrombosis of the left sigmoid sinus, and a left anterior temporal lobe brain abscess. Underlying these infectious processes was a transcranial temporal bone meningioma with an intracranial *en plaque* component at the temporal bone, an intraosseous component in the tegmen tympani, and invasion into the mastoid and middle ear. The pathology from the mastoid biopsy returned as a grade I meningioma without having entered the dura (with immunohistochemical stains positive for

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PR and EMA, and negative for AE1/AE3 and chromogranin). The MRI showed intracranial dural enhancement localized to the area of the temporal bone overlying the hyperostotic area of the tegmen (Fig. 1b). Focal cerebritis was seen in an area of abnormal gyriform enhancement at the left anterior temporal lobe adjacent to the dural enhancement, which was treated clinically as a brain abscess with eight weeks of intravenous antibiotics (ceftriaxone plus metronidazole) after the CSF leak stopped. She was anticoagulated for the venous sinus thrombosis. On day 18 she had an audiogram showing mixed sensory and conductive hearing loss on the left with a speech reception threshold of 50 dB, and word discrimination at 96. She was discharged one month after admission, but has since been lost to follow up.

Discussion

Meningiomas of the temporal bone extending to the mastoid bowl or middle ear are rare, making up less than 1 % of all meningiomas; the vast majority are benign [1]. Chang et al. [2] examined 56 cases of secondary middle ear meningiomas and found that an intracranial mass can take four different routes to reach the middle ear or mastoid, in order of frequency: (1) the tegmen tympani (as in this case), (2) the jugular foramen, (3) the posterior fossa plate, and (4) the internal auditory canal. En plaque tumors of the temporal bone cause serous otitis media, aural fullness, and chronic discharge after insertion of ventilating tubes [3]. Although serous otitis media is the most common presenting symptom for en plaque temporal bone meningiomas there is a delay of 3.7 years on average prior to diagnosis, ranging from 1 to 10 years [3]. In Hamilton's retrospective review of six cases of meningioma primary to the tegmen tympani, all arose from the floor of the middle cranial fossa, and spread infero-medially to the middle ear cavity, similar to our case [4]. Characteristic CT features included thickening of the tegmen tympani (5/6 cases). A middle ear cavity soft-tissue mass, present in all cases, resulted in ossicular encasement or abutment in 5/6 cases. No ossicular erosion or destruction was observed in any case. MR imaging findings characteristic of every tegmen tympani meningioma were en plaque linear dural enhancement along the floor of the middle cranial fossa and homogenous soft-tissue enhancement.

Temporal bone meningiomas, in the process of extending outward to the mastoid air cells and middle ear, rarely create a route for microorganisms to enter the intracranial vault. Brydoy and Ellekjaer [5] described four possible pathways for direct spread of infection from the middle ear to the meninges: (1) following otomastoiditis by progressive osteolytic destruction of the bone prior to exposure, localized inflammation and finally penetration of the dura; (2) hematogenous osteothrombotic spread via anastomoses between small veins of the temporal bone and those of the dura; (3) direct spread following an ear infection through preformed pathways; and (4) following temporal bone fracture, aural surgery and through normal anatomical structures such as the round window or oval window. In our patient the pathway of spread was likely the first of the four described. A brain abscess in the temporal lobe could be due to direct extension of the infection, or hematogenous spread from breakdown of the blood–brain barrier by the meningioma. In our patient there could have been direct extension from the mastoiditis to the dura allowing brain abscess formation although hematogenous spread is also possible given that the patient had positive blood cultures for *S. pneumoniae* on admission. Finally septic thrombosis of the sigmoid sinus was

associated with infection of the mastoid air cells. The infection spreads from the mastoid directly to the epidural space overlying the lateral sinus or spreads via emissary veins.

Early recognition and awareness of the infectious complications of temporal bone meningiomas secondary to local invasion can lead to more prompt diagnosis of this rare tumor.

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Fig. 1.

a A non-enhancing temporal bone CT showing hyperostosis of the left tegmen (*grayscale*);

b A post-contrast sequence MRI showing dural enhancement localized to the area of the temporal bone overlying the hyperostotic area of the tegmen, and gyriform enhancement of the left temporal lobe suggestive of focal cerebritis and brain abscess (*grayscale*)