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Meningoma located primarily within the internal auditory canal – a case report

Oponiak zlokalizowany pierwotnie w przewodzie słuchowym wewnętrznym – opis przypadku

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ABSTRACT: A 34-year old male presented with a 5-year history of hearing loss and tinnitus. MRI revealed a intracanalicular tumor deep inside the internal auditory canal invading partially cochlear ganglion. The mass was surgically resected by middle fossa approach. The histological findings showed meningoma primarily located in IAC. This study presents epidemiology, features and treatment of intracanalicular meningomas.

KEYWORDS: cerebellopontine angle, meningioma, internal auditory canal

STRESZCZENIE: Opis przypadku 34-letniego mężczyzny z 5-letnim wywiadem osłabienia słuchu i szumów usznych. W rezonansie magnetycznym zobrazowano guza położonego głęboko w przewodzie słuchowym wewnętrznym, wnikającego częściowo do zwoju spiralnego ślimaka. Zakwalifikowano do resekcji zmiany przez środkowy dół czaszki. Badanie histopatologiczne wykazało oponiaka pierwotnie zlokalizowanego w przewodzie słuchowym wewnętrznym. W niniejszym opracowaniu przedstawiono epidemiologię wewnątrzprzewodowych oponiaków, ich cechy charakterystyczne oraz omówiono postępowanie.

SŁOWA KLUCZOWE: kąt mostowo-móżdżkowy, oponiak, przewód słuchowy wewnętrzny

INTRODUCTION

Meningiomas are the most frequent benign intracranial tumors and the second most frequent tumors of the cerebellopontine angle (CPA), comprising 10-15% of CPA tumors, with vestibular schwannomas being most frequent [1]. Meningiomas of the internal auditory canal (IAC) originate either from the IAC itself or from the CPA, in which case they grow into the IAC. Notably, the former are much rarer, with only 50 cases described to date [2, 3]. In this case report, we describe a patient with a meningioma that originated from the IAC and discussion surgical management of such tumors.

CASE REPORT

In May 2015, a 34-year-old man presented to our department with a 5-year history of hearing impairment and tinnitus in the left ear. On pure tone audiometry, hearing in the right ear was normal, and in the left ear, moderate sensorineural hearing loss in the range of low and high frequencies was found. On speech audiometry, hearing in the right ear was normal, and speech understanding in the left ear was below 80% (Fig. 1). Magnetic resonance imaging (MRI) revealed a solid, gadolinium-enhancing mass (5.5x3.5 mm) in the lateral part of the IAC that was neighboring the cochlea and extending into the cochlear spiral ganglion (Fig. 2, Fig. 3).

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The patient was qualified for surgical resection through the middle cranial fossa. An incision was made anteriorly to the auricle, which revealed the temporal bone. Temporal craniotomy (3 x cm) was made with a bone cutter, which visualized the petrous apex of the temporal bone with the greater petrosal nerve. The IAC was opened from its upper part to the internal acoustic opening. After revealing the facial nerve and the superior vestibular nerve, these nerves were separated, and the vestibular nerve was severed. Subsequently, a soft, maroon tumor was visualized at the base of the cochlea (Fig. 4). The tumor was dissected and completely removed without interruption of the facial nerve. The middle cranial fossa was filled with the temporal muscle and temporal fascia. On day 4 since surgery, the patient reported severe headache that did not respond to pharmacological treatment. We performed imaging, twice, but it did not reveal any abnormalities. Due to a risk of intracranial infection, we decided to revise the middle cranial fossa on day 9 since tumor removal. There was no inflammatory infiltration in the tissue samples that were taken during revision surgery, and headache wore off gradually. The patient was discharged on day 15 since tumor removal. On histopathology, the tumor was diagnosed as a meningioma, which is very rare for tumors that originate from the IAC. In the perioperative period, the patient experienced severe sensorineural hearing loss (Fig. 5) due to the fact that the tumor was located at the entry site of the cochlear nerve to the IAC. Facial nerve function was estimated to be 3/6 on the House-Brackmann scale, and the patient continued physical therapy of facial muscles on an outpatient basis. At 1-year follow-up, facial nerve function improved to 2/6 on the House-Brackmann scale.

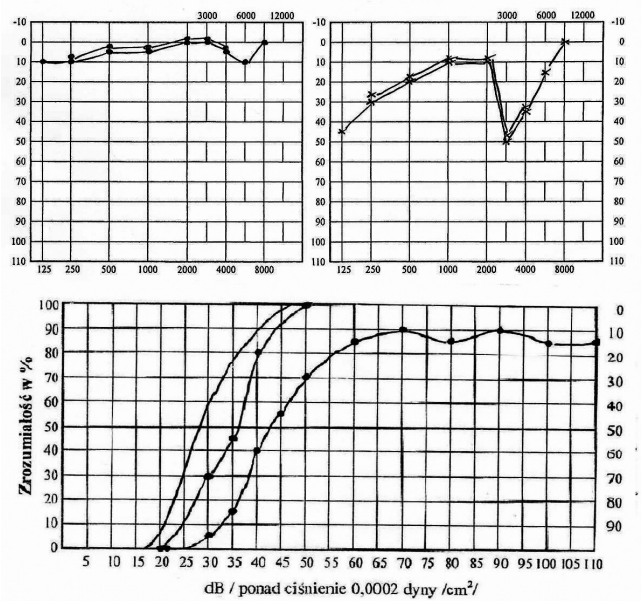

Fig. 1. Pure tone and speech audiometry before surgery.

DISCUSSION

Meningiomas originate from the epithelium that covers the arachnoid mater (menigomthelial cells) and in 90% of cases are benign. They usually are well vascularized and develop in the proximity of venous vessels or sinuses [4].

Meningiomas are the most common benign brain tumors, accounting for 26% of all primary tumors of the central nervous system. Of note, 5-10% of intracranial meningiomas are localized in the CPA [2], where they originated form the arachnoid mater that covers the venous sinuses of the posterior surface of the petrosal part of the temporal bone [5]. According to Kane et al., meningiomas in the CPA infiltrate the IAC in 60% of cases [1].

In 1970, Nager and Masica demonstrated that arachnoid granulations are present not only in venous vessels and sinuses but also along the greater petrosal nerve, in the IAC, around the geniculate ganglion, and in the jugular foramen [6]. Due to that, meningiomas can also originate from the IAC, albeit very rarely [7,8].

Based on a histopathological analysis, Nager and Masica showed that meningiomas in the IAC can infiltrate the labyrinth and the cochlea along the nerve fibers [6]. This could partially explain progressive hearing loss in patients with meningiomas in the IAC, although compression of the surrounding structures plays a more important role in the pathogenesis of clinical symptoms [9]. In large spaces such as the CPA, tumors can grow asymptomatically, whereas in smaller spaces such as the IAC, they quickly become symptomatic.

Symptoms of meningiomas in the IAC resemble those of schwannomas and include primarily hearing loss of varying severity. Other symptoms are tinnitus, gait imbalance, vertigo, or fullness in the ear [3,9]. In comparison to schwannomas, meningiomas more often involve the facial nerve, although facial nerve dysfunction is rarely observed as an initial symptom [10].

Most of intracanalicular meningiomas are diagnosed as schwannomas due to similar imaging characteristics [5]. Imaging feature such as a broad basis, intratumoral calcifications, hyperostosis of the neighboring bone, or dural tail (an elongated pattern of contrast enhancement) can suggest a meningioma but are not pathognomonic [11, 12].

Intraoperative features that can indicate meningiomas include soft structure, good vascularization, adhesion to the facial and cochleovestibular nerves, and bone infiltration.

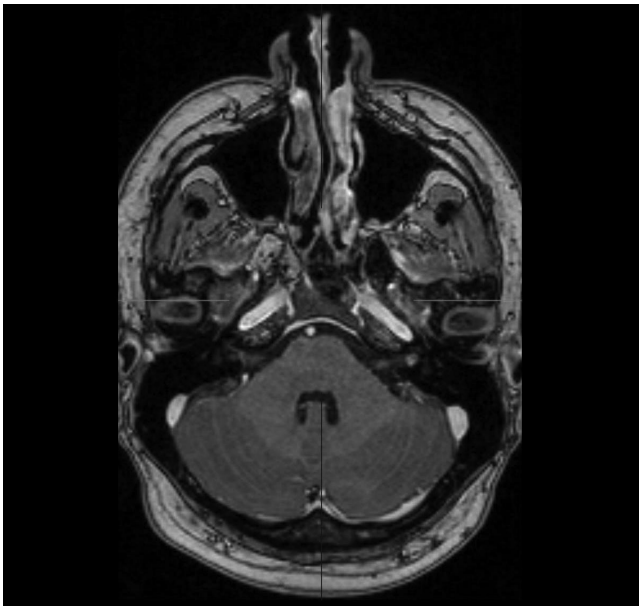

Fig. 2. MRI, T1-weighted sequence, transverse plane. A 5.5x3.5 mm, contrast-enhancing lesion in the lateral part of the IAC is seen (corresponding to a meningioma).

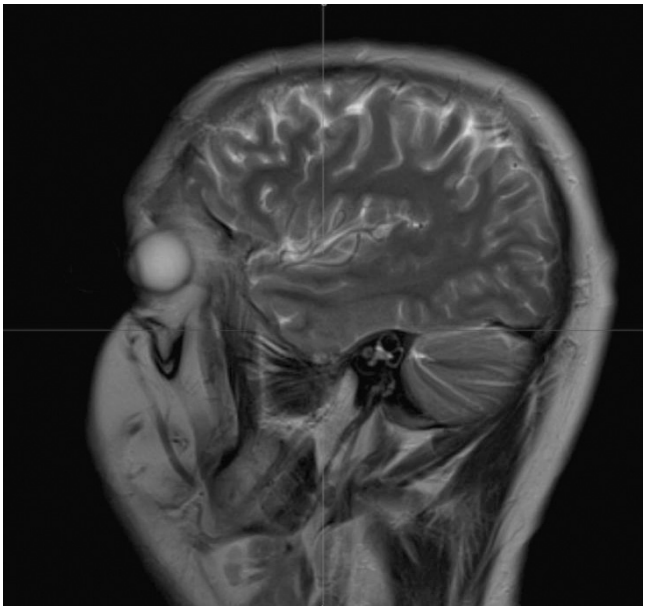

Fig. 3. MRI, T2-weighted sequence, sagittal plane. Cerebrospinal fluid decrement in the lateral part of the IAC neighboring the cochlea (corresponding to a meningioma).

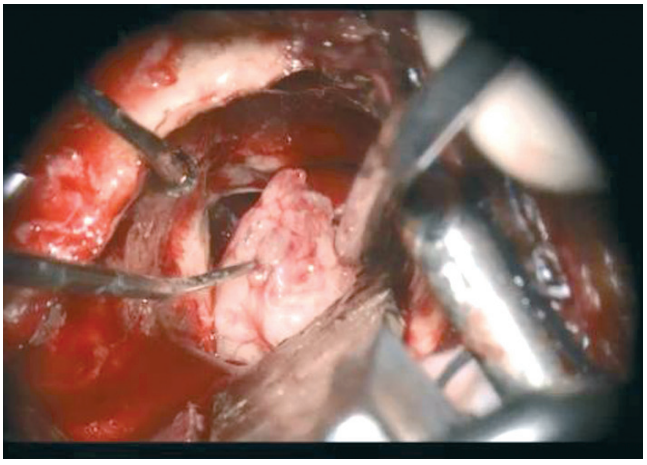

Fig. 4. Intraoperative view. Tumor removal through the middle cranial fossa.

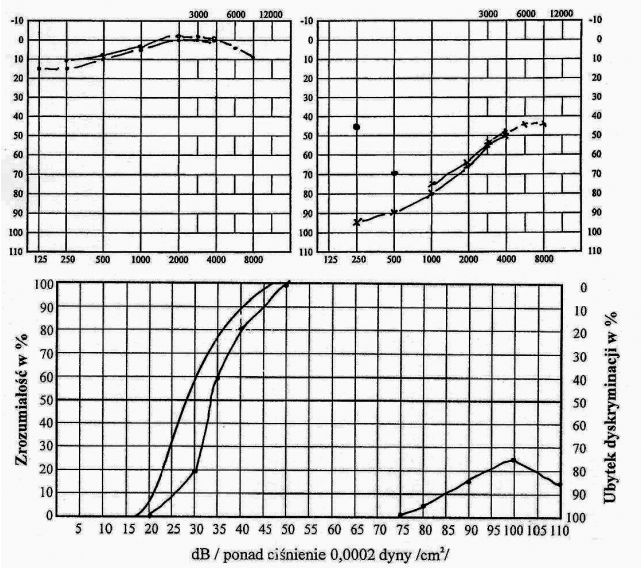

Fig. 5. Pure tone and speech audiometry after surgery.

Due to an involvement of the spiral ganglion, sensorineural hearing loss can develop. The risk of facial nerve dysfunction is similar in meningiomas and schwannomas due to a similar surgical approach. Our patient experienced severe hearing loss on the side of surgery, but sound perception was preserved in the range of high frequencies.

CONCLUSION

Meningiomas limited to the IAC are rare, but they should always be included in the differential diagnosis. Clinical presentation and radiological characteristics alone are not sufficient for making a final diagnosis. Intraoperative characteristics can differentiate meningiomas from schwannomas. In order to prevent recurrence, meningiomas should be removed together with the infiltrated arachnoid mater or even with the neighboring bone in the case of large lesions. Dissecting meningiomas from the surrounding nerves is difficult because of adhesions.

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