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Case Report

Recurrent Primary Inverted Papilloma of the Mastoid with Intracranial Invasion: A 7-Year Follow-Up

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A 55-year-old man presented to the otolaryngology department complaining of aural fullness in his left ear after an episode of probable otitis 3 months before. magnetic resonance imaging revealed a soft tissue mass within the mastoid cavity that had destroyed the posterior wall of the middle ear with no apparent middle ear or sinonasal origin. The patient underwent a left canal wall-up tympanomastoidectomy, and the pathology report confirmed an inverted papilloma. Inverted papillomas are uncommon benign epithelial tumors related to a high recurrence rate and high risk of secondary malignant transformation after multiple surgeries. The patient has undergone 2 additional surgical interventions involving the neurosurgery team due to recurrent inverted papilloma that exerted a mass effect over the left cerebellar hemisphere. Despite no signs of recurrence on magnetic resonance imaging 5 years after the last surgery, at least 1 radiologic study per year is granted. Clinical multidisciplinary follow-up including nasal endoscopy and head and neck examination as a part of a stringent follow-up is essential to rule out synchronous nasosinusal inverted papillomas.

KEYWORDS: Cholesteatoma, ear surgery, inverted papilloma, mastoid cavity, otology

INTRODUCTION

Inverted papilloma (IP) is a rare nasosinusal benign tumor arising from the ciliated columnar epithelium lining of the nasal cavity and paranasal sinus.[1] Inverted papilloma may spread outside the nasal cavity and nasopharynx in 10% of the cases and in less than 2% into the intracranial fossa.[2] However, there is still no consensus on whether IP of the mastoid cavity comprises the same pathology as sinonasal IP.[3] Inverted papilloma of the mastoid can be classified into a primary tumor that does not involve sinonasal disease and a secondary tumor with synchronous or previous sinonasal papillomas.[4] Only 16 primary IP cases originating from the mastoid cavity and middle ear have been reported until now.[5] The pathophysiology of IP remains unclear, but possible associations such as human papillomavirus (HPV) and chronic inflammation have been stated.[1,4] Previous studies describe a high risk of secondary malignant transformation after multiple surgeries leading to a bad prognosis.[2] We report a 7-year follow-up of a patient with recurrent IP with intracranial invasion and no apparent middle ear or sinonasal origin.

CASE PRESENTATION

In February 2014, a 55-year-old male was referred to the otolaryngology department complaining of aural fullness in his left ear without otalgia or otorrhea. The symptoms started after an episode of probable otitis which occurred 3 months before his visit. In terms of his past surgical history, he had undergone a tympanoplasty due to tympanic perforation 15 years before consulting our department. Otoscopy of the left ear revealed a mild thickening of the tympanic membrane. His nasal endoscopy and head and neck examination were normal. Pure-tone audiometry indicated a mild mixed hearing loss in the left ear, probably secondary to the tympanoplasty. Speech-sound audiometry showed 100% bilateral discrimination at 50 dB, and a tympanogram exhibited a B-type curve in the left ear. A computed tomographic (CT) scan of the temporal bone revealed a 3 × 3 cm left mass in the mastoid cavity eroding the sinus plate,

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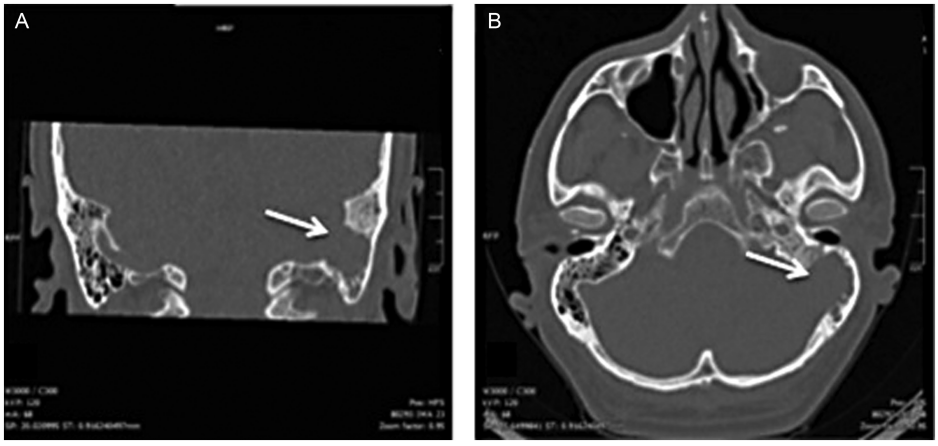

Figure 1. A. The coronal section of the initial CT scan. B. The axial section of the initial CT scan. A mass in the left mastoid is evidenced (white arrows), with an approximate size of 3 × 3 cm and regular borders, eroding the wall in the mastoid cavity in contact with the sinus.CT, computed tomography.

as well as complete opacification of the left mastoid antrum (Figure 1). A magnetic resonance imaging (MRI) showed a mass with regular margins and a heterogeneous enhancement pattern within the mastoid cavity. It was in contact with the sinus plate and destroyed the posterior wall. Differential diagnoses included middle ear lesions that mimic common middle ear infections (cholesteatoma) and less common causes such as aspergilloma, paraganglioma, or a carcinoid tumor. The histopathological analysis obtained through an exploratory tympanotomy reported IP. Written informed consent was obtained from the patient who participated in this study.

Treatment

A left canal wall-up tympanomastoidectomy was performed in March 2014. The surgery revealed an encapsulated, reddish, irregular, moriform tumor that easily bleed; it surrounded the third portion of the facial nerve, caused posterior wall destruction, and was in contact with the sigmoid sinus, dura mater, inferior wall, stylomastoid foramen, and jugular bulb. Despite CT showing complete opacification of the left mastoid antrum, these radiological findings could be explained by inflammatory tissue located in the mastoid antrum. An exhaustive surgical removal of the tumor and dissection of the facial nerve and sigmoid sinus were performed with no complications. The histopathology report confirmed the previous IP diagnosis, and the polymerase chain reaction-restriction fragment was positive for HPV type 11, low risk. In August 2015, the MRI showed an expansive lesion in the left mastoid that infiltrated the adjacent temporal bone and exerted a mass effect over the left cerebellar hemisphere, with no middle ear involvement (Figure 3). It also revealed ipsilateral thrombosis of the transverse sigmoid sinus and the jugular vein. The patient

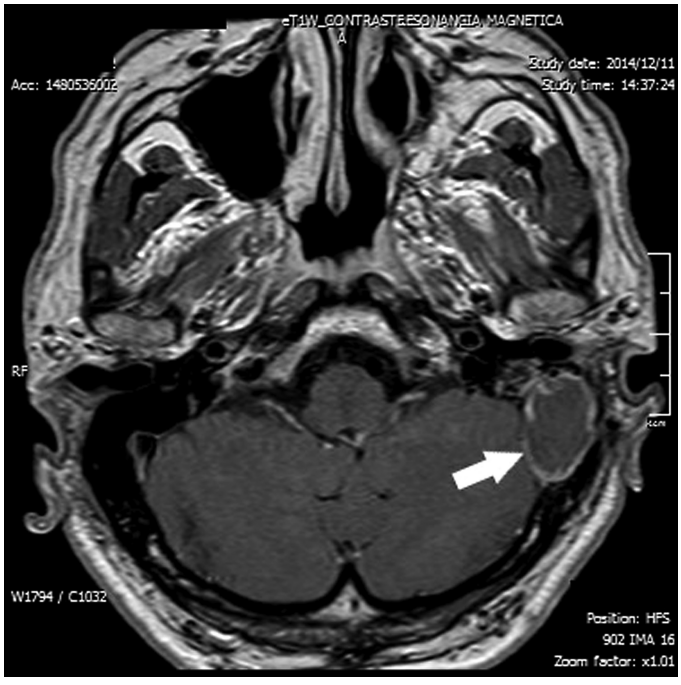

Figure 2. The axial section of an MRI 10 months after the first surgery shows recurrence of the tumor. There is evidence of a well-defined mass with soft tissue density (white arrow). The mass is in close contact with the cerebellum. MRI, magnetic resonance imaging.

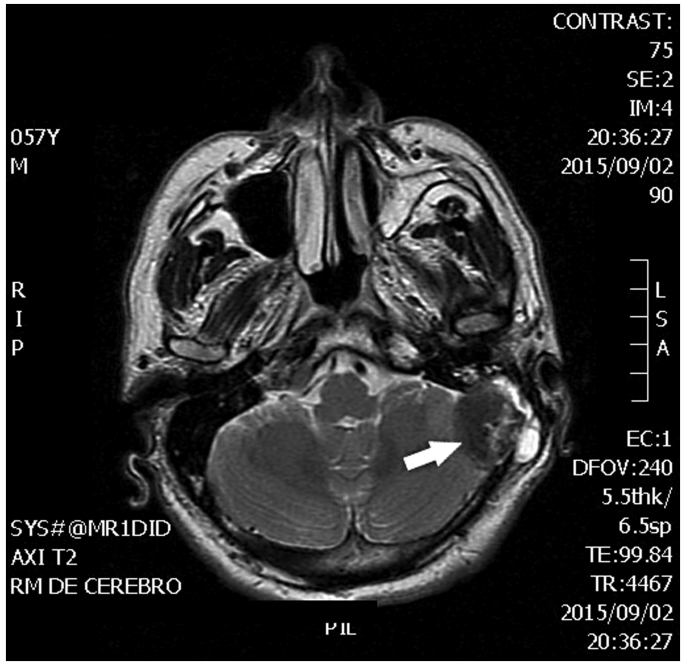

Figure 3. The axial section of an MRI before the second intervention shows a tumor. It demonstrates an expansive lesion (white arrow) in the postsurgical cavity, infiltrating the temporal bone and exerting a mass effect over the left cerebellar hemisphere. Compared to the previous findings, it is a more aggressive tumor. MRI, magnetic resonance imaging.

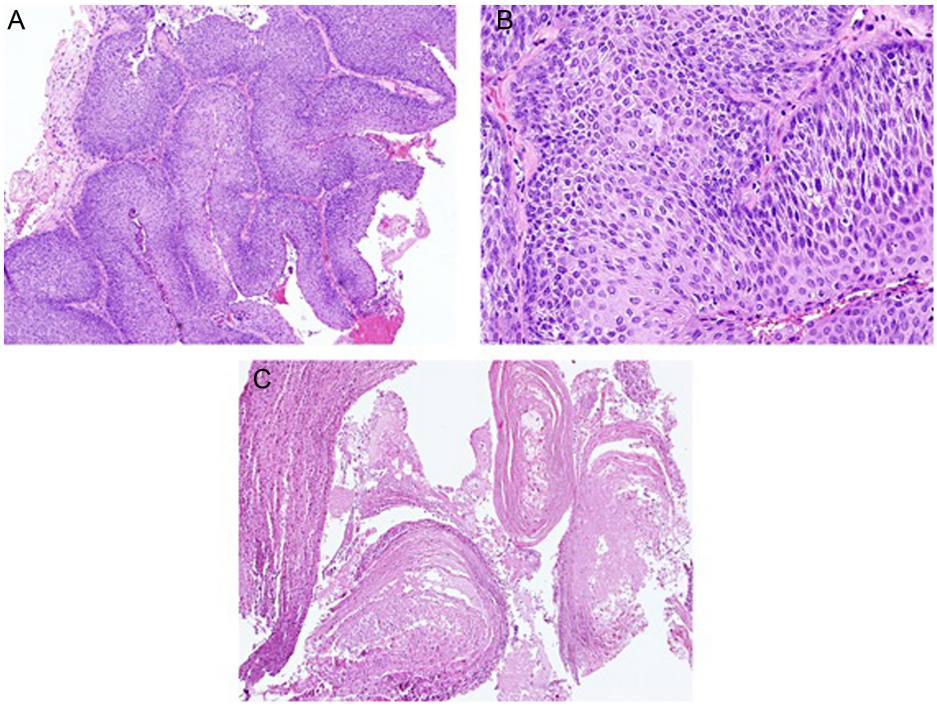

Figure 4. A. An inverted papilloma represented by squamous epithelial proliferation with an endophytic growth pattern toward the neighboring stroma (hematoxylin and eosin, 100×). B. Inverted papilloma with uniform and organized nuclei (hematoxylin and eosin, 400×). C. A Cholesteatoma with loose fragments of keratinized, stratified squamous epithelium and abundant keratin lamina and ancient hemorrhage.

was asymptomatic, but a second intervention with the neurosurgery team for total resection was warranted.

In September 2015, a revision left canal wall-up tympanomastoidectomy was performed. A palpable subcutaneous mass was noticed in the left retro auricular zone. Upon incision, a 5 × 6 mm cholesteatoma mass was observed in the post-surgical cavity along with residual tissue from the IP in the inferior and posterior flange. The borders of the mastoidectomy were widened until the limits of the dura mater in the anterior fossa and the posterior fossa were completely exposed. The neurosurgery team removed the margins of the tumoral tissue invasion without breaking the dura. The posterior and inferior flange was clear of papilloma remnants up until the mastoid tip. The histopathology report showed a combination of IP and a cholesteatoma (Figure 4), and the samples were positive for HPV type 11.

In October 2016, a control CT showed an oval mass in the left mastoid, with a mild expansive effect upon the left cerebellar hemisphere (Figure 5). A third canal wall-up tympanomastoidectomy and resection of a tumoral mass in the left pontocerebellar angle were scheduled. An IP (3 × 4 cm) covering the posterior and inferior flange and adhering to the dura mater and mastoid tip was found. The mastoidectomy borders were widened again, and the dura mater was exposed so that the neurosurgery team could perform a complete resection of the tumor margins. The histopathology report revealed an IP but showed no signs of cholesteatoma. The samples were also positive for HPV type 11. The patient insisted on getting 3 doses of the Gardasil vaccine (Merck & co Inc., United States of America).

Considering the high risk of secondary malignant transformation after multiple surgeries,[2] and our own clinical experience, we implemented a stringent follow-up strategy shown in Figure 7. To date,

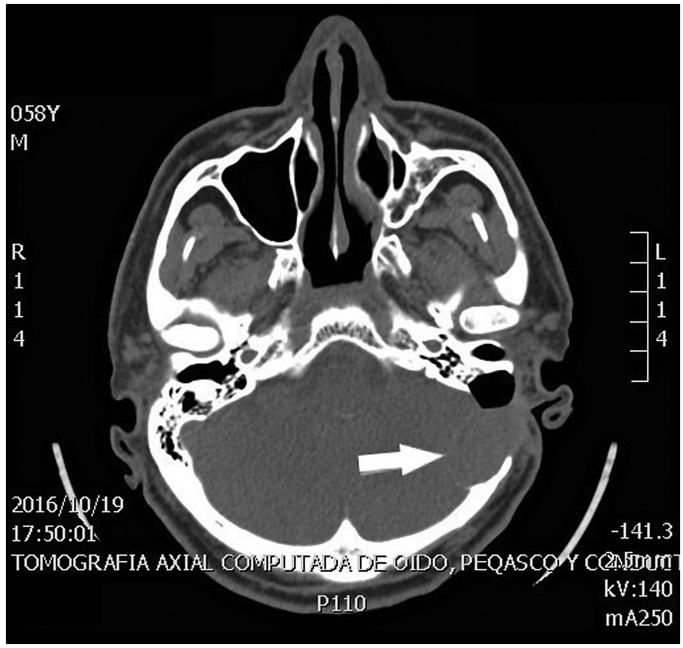

Figure 5. The axial section of the CT scan 2 months before the third surgery with recurrent IP. It shows postsurgical changes due to previous interventions. There is an oval mass (white arrow) that is remodeling the occipital bone, slightly hypodense, with a moderate expansive effect over the left cerebellar hemisphere. CT, computed tomography; IP, inverted papilloma.

5 years after the last surgery, we are performing at least 1 radiologic imaging study per year, as well as clinical multidisciplinary follow-up including nasendoscopy and head and neck examination. We also educated the patient about the importance of the clinical follow-up and the probable neuro-otologic symptoms to consult. No recurrent lesion was found in the last MRI from march 2021 (Figure 6), and no

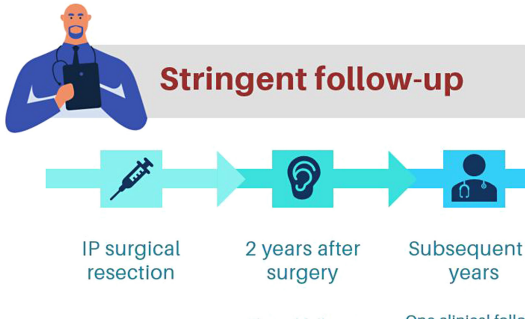

Figure 6. Stringent follow-up strategy for primary IP of the mastoid. IP, inverted papilloma.

evidence of synchronous association with a nasosinusal IP has been found. Long-term otolaryngology follow-up is granted to detect any possible relapse early enough.

DISCUSSION

Inverted papilloma pathogenesis remains unclear, but 3 mechanisms of temporal fossa involvement have been stated: (i) direct extension of paranasal sinus-IP cells via the Eustachian tube, (ii) middle ear involvement secondary to metaplastic changes of the mucosa, and (iii) inflammatory cells of chronic otitis media stimulus.[6,7] In this case report, the histopathology description of the second surgery showed a combination of IP and a cholesteatoma, which could also be implantation epidermoid. Chronic inflammation after the first surgical intervention could be related to the aggressive expansion and recurrence of the IP. Therefore, this would match the third theory (inflammatory cells) on the pathogenesis of IP.[7] Similarly, a case of IP of the mastoid cavity secondary to cholesteatoma surgery[8] and an IP that developed from a congenital cholesteatoma was described.[9]

A meta-analysis reported that high-risk HPV types (16, 18) were associated with malignant transformation of sinonasal IP [12]. We recommend typing for HPV to assess the relationship between HPV infection and temporal bone IP. Acevedo-Henao et al[2] underlined the 2 main issues to consider in IP: frequent synchronous association with a nasosinusal IP and the high incidence of malignant transformation after numerous surgical removals. Thus, at least 1 radiologic study per year is granted, and follow-up including nasal endoscopy and head and neck examination is essential. Magnetic resonance imaging has high sensitivity and specificity for discriminating recurrent tumors from postoperative changes and has an important role in this long-term follow-up.[2] Up to 2021, no recurrence has been found on the MRI; however, there is a high risk of secondary malignant transformation. Therefore, long-term clinical and radiological follow-up is crucial since recurrence is frequent and death from intracranial invasion has been reported.[10]

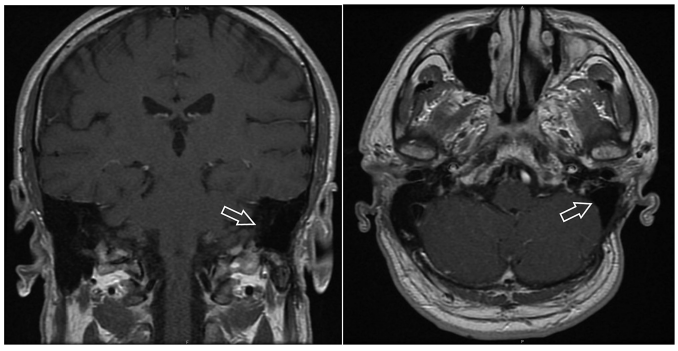

Figure 7. The follow-up MRI with gadolinium: 5 years after the last surgical intervention. It shows postsurgical changes of left mastoidectomy. There is no evidence of any recurrent lesion. MRI, magnetic resonance imaging.

CONCLUSION

There are a high recurrence rate and risk of secondary malignant transformation of IP of the mastoid after multiple surgeries. Stringent and long-term postsurgical follow-up are needed, as well as aggressive surgical management in recurrent cases. We recommend at least 1 radiologic study (MRI) per year, as well as stringent follow-up including nasal endoscopy and head and neck examination.

Informed Consent: Written informed consent was obtained from the patient who participated in this study.

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