The Journal of International Advanced Otology

J Int Adv Otol 2021; 17(1): 87–90 • DOI: 10.5152/iao.2020.8415

Case Report

Bilateral Hearing Loss Due to Metastatic Gastric Signet Cell Adenocarcinoma Involving the Internal Auditory Canal and Cerebellopontine Angle

Mohamed Bassiouni, Heidi Olze, Philipp Arens

Department of Otorhinolaryngology, Charité—Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Berlin, Germany

Cite this article as: Bassiouni M, Olze H, Arens P. Bilateral Hearing Loss Due to Metastatic Gastric Signet Cell Adenocarcinoma Involving the Internal Auditory Canal and Cerebellopontine Angle. J Int Adv Otol 2021; 17(1): 87-90.

Intracranial metastases of stomach cancers are very rare and are associated with a poor prognosis. Of those, metastases of gastric cancers in the internal auditory canal and cerebellopontine angle represent an extremely rare subgroup. Such metastatic lesions may be indistinguishable from vestibular schwannomas in imaging studies and clinical presentation. In this report, we describe a case of gastric signet cell adenocarcinoma metastasizing to the internal auditory canal and cerebellopontine angle bilaterally and causing bilateral hearing loss, including a unilateral sudden deafness. Due to the co-detection of multiple other intracranial masses in the magnetic resonance imaging scan, the suspected diagnosis of leptomeningeal metastatic disease was clear, and the patient was referred to palliative whole brain radiotherapy. The case further highlights the importance of prompt diagnosis and treatment of metastatic cerebellopontine angle lesions to prevent permanent neurological sequelae. Metastatic tumors should therefore be considered in the differential diagnosis of cerebellopontine angle lesions, especially in patients with a known history of malignant disease.

KEYWORDS: Hearing loss, cerebellopontine angle, neoplasm metastasis, gastric cancer, diagnostic imaging

INTRODUCTION

Metastatic lesions of the internal auditory canal (IAC) and cerebellopontine angle (CPA) are extremely rare, representing 0.2% of all CPA masses [1]. The most commonly associated primary tumors include lung, breast, and renal cancers [1-3]. In one large temporal bone histopathological study, metastases to the IAC represented 27.6% of the total metastatic temporal bone tumors [4]. Although brain metastases of stomach cancers are very rare, CPA metastasis of gastric cancers have been reported [5-9]. Such metastatic lesions may mimic vestibular schwannomas in imaging studies and clinical presentation, making a preoperative diagnosis often impossible [10]. Since intracranial metastases of gastric cancer generally indicate a very poor prognosis [11], the prompt diagnosis and treatment of such lesions may have important consequences for the patient survival and remaining quality of life.

CASE PRESENTATION

A 44-year-old man was presented to the emergency department with worsening dizziness and double vision, which he has had for approximately ten days. The patient had a known history of signet cell adenocarcinoma of the stomach, which was diagnosed seven years earlier and treated with total gastrectomy with systematic lymphadenectomy and chemotherapy. The patient had undergone his last follow-up computer tomography (CT) scan six months ago, showing no signs of recurrence or distant metastasis. Upon first presentation in the emergency department, the patient additionally reported having a sudden left-sided hearing loss for a month, for which he had not sought medical attention. A magnetic resonance imaging (MRI) scan of the brain was performed. The MRI scan showed multiple space-occupying lesions along multiple cranial nerves, displaying the typical appearance of leptomeningeal carcinomatosis. A diagnostic upper gastrointestinal endoscopy did not reveal any local tumor recurrence of the gastric adenocarcinoma. The patient was admitted and underwent a full body CT scan. Except the multiple intracranial metastases, the CT scan did not show any local recurrence or other distant metastasis. Due to his left-sided hearing loss, an otolaryngology consultation was ordered. The patient showed normal otoscopic findings but had a moderate right-sided sensorineural hearing loss and a left-sided dead ear on pure tone audiometry (Figure 1). The patient had not been fully aware of his right-sided hearing loss, presumably due to its gradual nature. Upon careful review of his MRI scan by a neuroradiologist and an otolaryngologist, the patient was shown to have metastases occupying the CPA and IAC bilaterally, with the left side showing a larger lesion with an extrameatal diameter of

Corresponding Address: Mohamed Bassiouni E-mail: mohamed.bassiouni@charite.de

Submitted: 04.04.2020 • **Revision Received:** 05.09.2020 • **Accepted:** 05.17.2020

Available online at www.advancedotology.org

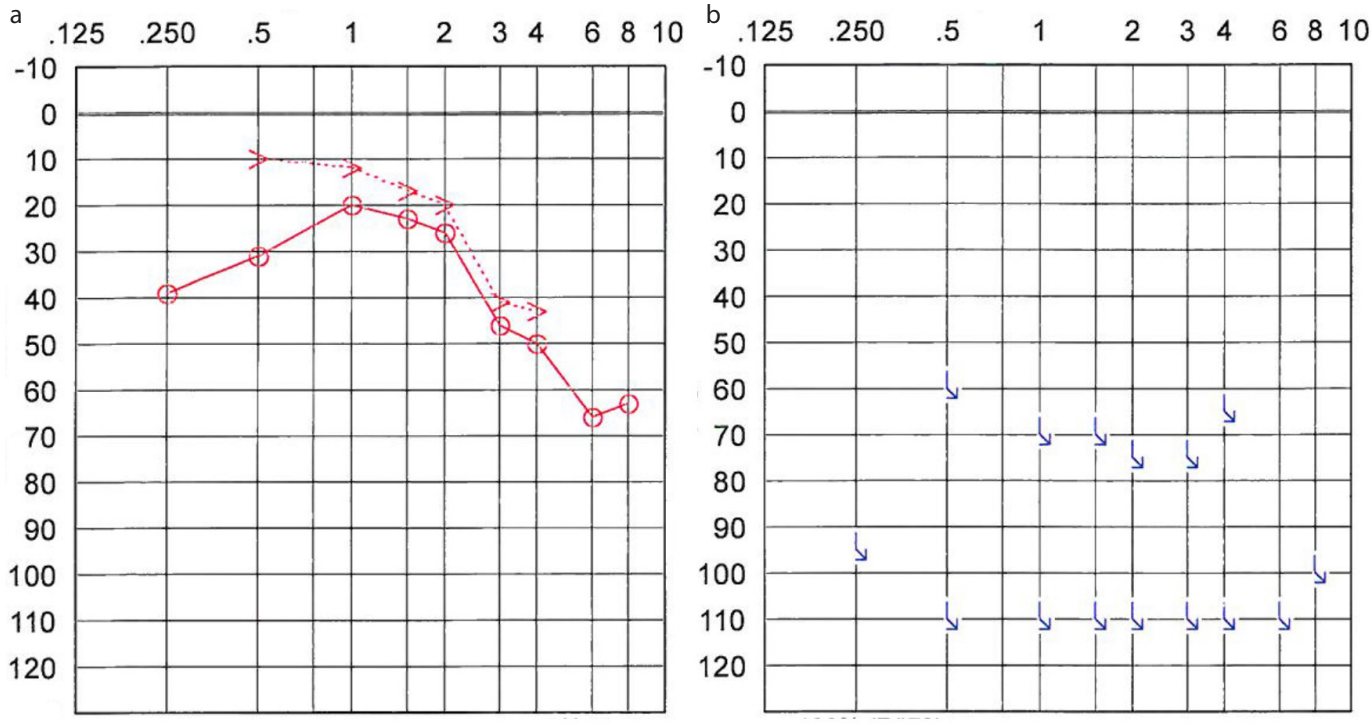

Figure 1. a, b. Pure-tone audiogram with the sound intensity in decibels plotted on the y-axis, and the frequency in Kilohertz plotted on the x-axis. The audiogram shows moderate sensorineural hearing loss in the right ear (a: red curves) and complete deafness (dead ear) on the left side (b: blue points).

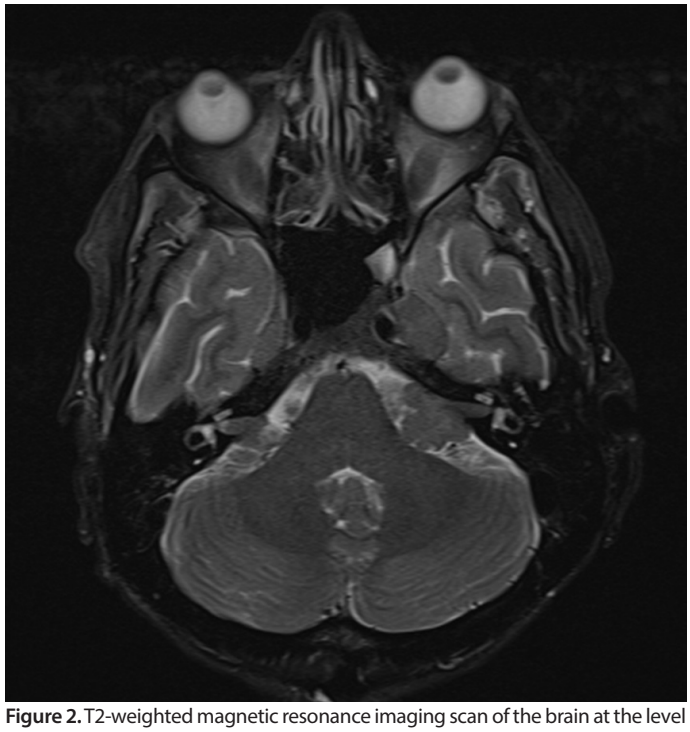

Figure 2. T2-weighted magnetic resonance imaging scan of the brain at the level of the internal auditory canals (IAC). The scan shows bilateral masses in the IAC and cerebellopontine angle (CPA), with left side showing a larger mass.

2.5 cm, corresponding to the same side of the reported hearing loss (Figure 2). In both the T1- and T2-weighted images, the lesions were isointense to the surrounding brain. The lesions had both intracanalicular and extracanalicular components and showed enhancement in the T1-weighted images after intravenous gadolinium administration (Figure 3). The other symptoms and neurological deficits could be explained by other meningeal metastases, which involved the left cavernous sinus and hippocampus, as well as Meckel's cave bilaterally. Due to the lack of options for hearing rehabilitation in this case, no further hearing investigations were performed. A diagnostic lumbar puncture and cerebrospinal fluid (CSF) examination showed typical findings of leptomeningeal carcinomatosis. Considering the palliative nature of the diagnosis and the associated poor prognosis as well as the highly probable metastatic nature of the brain lesions, an invasive surgical biopsy was not deemed useful. The patient received intrathecal chemotherapy with methotrexate and subsequently underwent palliative whole-brain radiotherapy. The patient was offered hospice care, but he elected to be discharged and went home. The patient was thereafter lost to follow-up and is presumed to be deceased.

DISCUSSION

Tumors of the IAC and CPA are much more likely to be benign than malignant [3]. The differential diagnosis of CPA masses should always start with vestibular schwannomas, which represent approximately 80-90% of total CPA lesions [3]. Even in patients with a known history of malignant disease, a CPA lesion should not be always assumed to be metastatic. For instance, a previous study reported an equal incidence of benign and metastatic tumors in a small group of 6 patients with an extracranial malignant tumor and concurrent CPA lesion [12]. An increased suspicion of malignancy is associated with facial nerve palsy, rapid progression, and presence of extracranial metastases [12]. Warren and colleagues [13] described some suggestive radiological findings, which may raise the suspicion of malignancy, such as adjacent vasogenic edema, eccentric location to the internal auditory canal, and multiple concurrent intracranial lesions. However, distin-

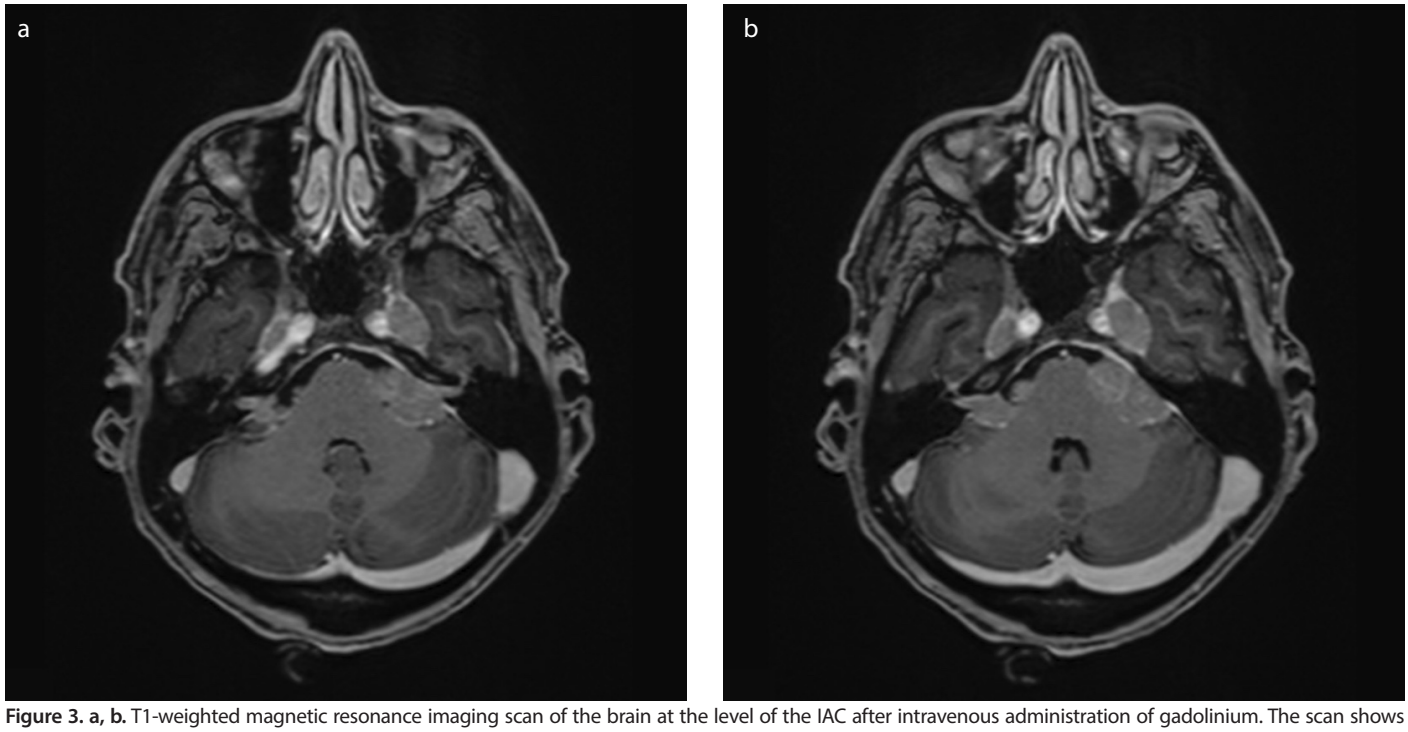

Figure 3. a, b. T1-weighted magnetic resonance imaging scan of the brain at the level of the IAC after intravenous administration of gadolinium. The scan shows bilateral masses in the IAC and CPA, which show contrast enhancement.

guishing a metastatic malignancy from a vestibular schwannoma may not be always possible based on imaging studies alone. Accordingly, many malignant cases are often diagnosed intraoperatively or even postoperatively based on their histology [10]. In a similar case, recently reported by Kimura and colleagues [14], the definitive diagnosis was confirmed by autopsy, which showed the infiltration of facial and vestibulocochlear nerves in the IAC due to adenocarcinoma. In our case, although postmortem pathological analysis would have provided valuable insights, it was not possible as the patient was lost to follow-up.

Gastric cancer metastases in the IAC and/or CPA with associated hearing loss are exceedingly rare, as they have only been described in a few reports in the literature [5-9]. Intracranial metastasis usually indicates a bad prognosis and requires early detection and treatment to prevent permanent neurological sequelae [11]. Although hearing rehabilitation with unilateral cochlear implantation is generally successful in patients with single-sided or asymmetric deafness [15], the patient in this report was not deemed a candidate for such therapy, owing to the malignant nature of the disease and its very poor prognosis.

CONCLUSION

This case report aims to alert otolaryngologists to the possibility of metastases in the IAC and CPA, which mimics vestibular schwannomas, and results in hearing loss. Therefore, despite their rarity, metastatic malignancies should always be included in the differential diagnosis of CPA masses, especially in patients with a known history of malignancy. Although magnetic resonance imaging is generally recommended in all patients with sudden idiopathic sensorineural hearing loss, this case emphasizes the particular importance of prompt brain MRI scanning in cancer patients with unilateral or asymmetric hearing loss, as the early detection of intracranial metastases influences the prognosis und survival.

Informed Consent: The patient was lost to follow-up, could not be reached for consent and is assumed deceased. The deceased patient's family could not be traced for consent. The anonymization of the patient's data ensures no harm to the patient's family.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – M.B., P.A.; Design - M.B., P.A.; Supervision - H.O., P.A.; Resource - H.O., P.A.; Materials - H.O., P.A.; Data Collection and/or Processing - M.B., P.A.; Analysis and/or Interpretation – M.B., H.O., P.A.; Literature Search - M.B., H.O., P.A.; Writing - M.B., H.O., P.A.; Critical Reviews - M.B., H.O., P.A.

Acknowledgements: The authors would like to thank the audiology staff for their support.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Brackmann DE, Bartels LJ. Rare tumors of the cerebellopontine angle. Otolaryngol Head Neck Surg (1979) 1980; 88: 555-9. [Crossref]
2. Yuh WT, Mayr-Yuh NA, Koci TM, Simon JH, Nelson KL, Zyroff J, et al. Metastatic lesions involving the cerebellopontine angle. AJNR Am J Neuroradiol 1993; 14: 99-106.
3. Moffat DA, Ballagh RH. Rare tumours of the cerebellopontine angle. Clin Oncol (R Coll Radiol) 1995; 7: 28-41. [Crossref]
4. Belal A Jr. Metastatic tumours of the temporal bone. A histopathological report. J Laryngol Otol 1985; 99: 839-46. [Crossref]
5. Suzuki Y, Kaga K, Sugiuchi Y, Ishii T, Suzuki J, Takiguchi T. Sudden bilateral hearing loss due to gastric carcinoma and its histological evidence. J Laryngol Otol 1997; 111: 1142-6. [Crossref]
6. Cao X, Cui F, Wei J, Wang Q, Deng LC, Liu BR, et al. Hearing loss due to metastasis of gastric cancer to temporal bone: A case report. Oncol Lett 2016; 11: 1305-8. [Crossref]

7. Joo HY, Chae MH, Lim JH, Yi HG, Lee MH, Kim CS, et al. A case of gastric cancer manifesting as a solitary brain metastasis in the cerebellopontine angle that mimicked acoustic neuroma. Chonnam Med J 2013; 49: 133-5. [Crossref]
8. Han JK, Park KH, Lee MS, Lee CK. Gastric carcinoma metastasis to the internal auditory canal. Otol Neurotol 2012; 33: e19-20. [Crossref]
9. Yetiser S. Bilateral Cochleovestibulopathy Due to Internal Auditory Canal Metastasis in a Patient with Stomach Cancer. J Int Adv Otol 2016; 12: 353-5. [Crossref]
10. Falcioni M, Piccirillo E, Di Trapani G, Romano G, Russo A. Internal auditory canal metastasis. Acta Otorhinolaryngol Ital 2004; 24: 78-82.
11. Go PH, Klaassen Z, Meadows MC, Chamberlain RS. Gastrointestinal cancer and brain metastasis: a rare and ominous sign. Cancer 2011; 117: 3630-40. [Crossref]
12. Huang TW, Young YH. Differentiation between cerebellopontine angle tumors in cancer patients. Otol Neurotol 2002; 23: 975-9. [Crossref]
13. Warren FM, Shelton C, Wiggins RH, 3rd, Herrod HC, Harnsberger HR. Imaging characteristics of metastatic lesions to the cerebellopontine angle. Otol Neurotol 2008; 29: 835-8. [Crossref]
14. Kimura A, Takahashi Y, Mizutari K, Tsujimoto H, Nakanishi K, Shiotani A. A Case of Gastric Meningeal Carcinomatosis Involving Bilateral Hearing Loss: The Difference between Clinical Images and Autopsy Findings. J Int Adv Otol 2019; 15: 333-6. [Crossref]
15. Haussler SM, Kopke V, Knopke S, Grabel S, Olze H. Multifactorial positive influence of cochlear implantation on patients with single-sided deafness. Laryngoscope 2020; 130: 500-6. [Crossref]