Solitary Metastasis to the Facial/Vestibulocochlear Nerve Complex: Case Report and Review of the Literature

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Key words
- Adenocarcinoma metastasis
- Cerebellopontine angle
- Facial/vestibulocochlear nerve complex

Abbreviations and Acronyms
ACE: Angiotensin-converting enzyme
CPA: Cerebellopontine angle
IAC: Internal auditory canal
CSF: Cerebrospinal fluid
MRI: Magnetic resonance imaging

BACKGROUND: Distant metastasis of mucinous adenocarcinoma from the gastrointestinal tract, ovaries, pancreas, lungs, breast, or urogenital system is a well-described entity. Mucinous adenocarcinomas from different primary sites are histologically identical with gland cells producing a copious amount of mucin. This report describes a very rare solitary metastasis of a mucinous adenocarcinoma of unknown origin to the facial/vestibulocochlear nerve complex in the cerebellopontine angle.

CASE DESCRIPTION: A 71-year-old woman presented with several month history of progressive neurological decline and a negative extensive workup performed elsewhere. She presented to our institution with complete left facial weakness, left-sided deafness, gait unsteadiness, headache and anorexia. A repeat magnetic resonance imaging scan of the head revealed a cystic, enhancing abnormality involving the left cerebellopontine angle and internal auditory canal. A left retrosigmoid craniotomy was performed and the lesion was completely resected. The final pathology was a mucinous adenocarcinoma of indeterminate origin. Postoperatively, the patient continued with her preoperative deficits and subsequently died of her systemic disease 6 weeks after discharge.

CONCLUSIONS: The facial/vestibulocochlear nerve complex is an unusual location for metastatic disease in the central nervous system. Clinicians should consider metastatic tumor as the possible etiology of an unusual appearing mass in this location causing profound neurological deficits. The prognosis after metastatic mucinous adenocarcinoma to the cranial nerves in the cerebellopontine angle may be poor.
significant intracranial stenoses or aneurysm. A lumbar puncture with cerebrospinal fluid (CSF) analysis was remarkable for opening pressure of 166 mm H2O (reference, 100–200 mm H2O), total nucleated cell count of 53 cells/dL (reference, 0–5 cells/dL), 46% lymphocytes, 54% monocytes/macrophages, and a red cell count of 192 cells/dL (reference, 0–5 cells/dL). The protein count was significantly elevated at 84 U/L (reference, <4 U/L). Glucose was 49 mg/dL. Microbiology testing included negative bacterial cultures and negative varicella zoster virus, lyme, and human immunodeficiency virus polymerase chain reaction. Serum laboratory analysis was normal or negative including paraneoplastic panel and serum inflammatory markers were negative. Angiotensin-converting enzyme (ACE) level was mildly elevated at 400 mg/dL (reference, <40 mg/dL). A repeat temporal artery biopsy was performed, now converting enzyme (ACE) level was 4 mg/dL. AFB smear (most commonly used to identify an active tuberculosis), Gram stain, bacterial, fungal, and mycotic cultures were unrevealing. Polymerase chain reaction for toxoplasmosis, cytomegalovirus, lyme disease, human herpesvirus-6, Epstein-Barr virus, herpes simplex virus and mycobacterium tuberculosis were all negative. Positron emission tomography scan demonstrated mild increased fluorodeoxyglucose uptake in the right lung, middle fissure, as well as possible increased uptake in the right hilar lymph nodes and in the gastroesophageal junction. The lesions were believed to be very small, have low uptake on positron emission tomography, and likely inflammatory rather than neoplastic, as well as too small to allow for safe biopsy. Neurosurgery was then consulted for biopsy of the left CPA lesion extending into the IAC.

The patient was taken to the operative theater on August 2, 2013. A left retrosigmoid craniotomy was performed and the CPA was explored. The arachnoid of the CPA was noted to be extremely thickened and opaque. The thickened arachnoid was opened around the seventh-to-eighth cranial nerve complex. The cyt formation seen on the MRI scan was opened and found to be filled with very thick mucus. The seventh-to-eighth cranial nerve complex was identified and showed normal cell count. The protein count was 812 mg/dL and glucose was 40 mg/dL. Cytology, as well as paraneoplastic workup, was negative. CSF ACE was 4 mg/dL. AFB smear (most commonly used to identify an active tuberculosis), Gram stain, bacterial, fungal, and mycotic cultures were unrevealing. Polymerase chain reaction for toxoplasmosis, cytomegalovirus, lyme disease, human herpesvirus-6, Epstein-Barr virus, herpes simplex virus and mycobacterium tuberculosis were all negative. Positron emission tomography scan demonstrated mild increased fluorodeoxyglucose uptake in the right lung, middle fissure, as well as possible increased uptake in the right hilar lymph nodes and in the gastroesophageal junction. The lesions were believed to be very small, have low uptake on positron emission tomography, and likely inflammatory rather than neoplastic, as well as too small to allow for safe biopsy. Neurosurgery was then consulted for biopsy of the left CPA lesion extending into the IAC.

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both nerves appeared to be completely involved with a neoplastic process enlarging the nerves and encasing them. Intraoperative stimulation of the facial nerve at the brainstem did not result in any electromyographic response consistent with the patient’s known complete left facial weakness. An intraoperative auditory brainstem response could not be obtained. A preliminary pathology of the biopsy material from the abnormality along the seventh-to-eighth cranial nerve complex was consistent with metastatic adenocarcinoma. The posterior lip of the IAC was removed with the high speed drill and the entire lesion was resected including the involved left facial/vestibulocochlear nerve complex.

The immediate postoperative course was uncomplicated. Her preoperative deficits remained unchanged. The final pathology confirmed metastatic mucinous adenocarcinoma, with staining compatible with pulmonary or gastrointestinal/pancreato-biliary origin (Figure 3). It was believed that the lesion arose in the gastroesophageal junction with possible metastasis to the lungs and brain. On the day of discharge, she was ambulating with assistance and tolerating oral intake. She and her family ultimately declined additional investigation and treatment and she died on September 24, 2013.

**DISCUSSION**

Most mucinous adenocarcinomas are derived from simple glandular epithelia and originates from the gastrointestinal tract (less frequently from breast, lung, and pancreas or ovaries). The most common sites of distant metastasis of mucinous adenocarcinomas are ovary, peritoneum, liver, or lung ([4, 11]). In many patients with unknown primary cancer, the brain metastasis could be the initial presentation ([1, 5, 6, 10]). According to Narita and Shibui ([9], the primary sources of adenocarcinoma metastasis to the brain are lung (52.3%), breast (8.9%), renal (5.4%), rectum (5.2%), gastric (5.2%), and colon (4.1%).

Of all intracranial tumors, 6%–10% occur in the CPA ([3, 8]). In a series of 1354 CPA tumors, 91.3% were vestibular schwannomas, 3.1% meningiomas, 2.4% epidermoids, and about 3.2% of the tumors were trigeminal nerve schwannomas, arachnoid cysts, hemangiomas, hemangio-blastomas, astrocytomas, medulloblastomas metastatic tumors, dermoids, lipomas, malignant teratomas, and chondrosarcomas ([2]). Metastatic tumors to the CPA encompass about 0.7% of all tumors in this region, making this diagnosis extremely rare ([8]).

Clinical manifestations of a metastasis to the CPA are usually related to the regional cranial nerves with progressive hearing and balance dysfunction, facial weakness, and eventually dysphagia and dysphonia ([2, 7]).

**REFERENCES**

1. Agazzi S, Pampallona S, Pica A, Vernet O, Regli L, Porchet F, Villenure JG, Leyvra S: The origin of brain metastases in patients with an undiagnosed primary tumour. Acta Neurochirurgica 146: 153-157, 2004.
2. Brackmann DE, Bartels LJ: Rare tumors of the cerebellopontine angle: a 15-year experience. J Neurosurg Sci 41: 159-168, 1997.
3. Brunori A, Scarano P, Chiappetta F: Non-acoustic neuroma tumor (NANT) of the cerebello-pontine angle. Otolaryngol Head Neck Surg 88:555-559, 1986.
4. Chou YY, Jeng YM, Kao HL, Chen T, Mao TL, Lin MC: Differentiation of ovarian mucinous carcinoma and metastatic colorectal adenocarcinoma by immunostaining with beta-catenin. Histopathology 43:351-356, 2003.
5. D’Ambrosio AL, Agazzi S: Prognosis in patients presenting with brain metastasis from an undiagnosed primary tumor. Neurosurg Focus 21:E7, 2007.

**CASE REPORT**

![Figure 3](image-url) Metastatic mucinous adenocarcinoma with well-formed glands (A) immersed in mucinous background. Cells with signet ring appearance with pale cytoplasm and eccentric nuclei, filled with mucin are present (B). Hematoxylin and eosin stain; (A) x100; (B) x400. Cells are strongly positive for cytokeratin 7 ([C]) and only focally and weakly with cytokeratin 20 ([D]). Hematoxylin and eosin stain; ([A] x200. The morphology and immunophenotype are compatible with a variety of primary sites including upper gastrointestinal tract, pancreato-biliary tract, and lung. Polyclonal carcinoembryonic antigen and CDX2 showed very focal positivity, CDX2 being a marker of gastrointestinal tract origin, although it can be seen in other sites, and the thyroid transcription factor 1 was negative (not shown).
6. Jenkinson MD, Haylock R, Shenoy A, Husband D, Javadpour M: Management of cerebral metastasis: evidence-based approach for surgery, stereotactic radiosurgery and radiotherapy. Eur J Cancer 47: 649-655, 2011.

7. Lalwani AK: Meningiomas, epidermoids, and other nonacoustic tumors of the cerebellopontine angle. Otolaryngol Clin N Am 25:707-728, 1992.

8. Moffat DA, Ballagh RH: Rare tumours of the cerebellopontine angle. Clin Oncol 7:28-41, 1995.

9. Narita Y, Shibai H: Strategy of surgery and radiation therapy for brain metastases. Intern J Clin Oncol 14:275-280, 2009.

10. Ruda R, Borgognone M, Benech F, Vasario E, Soffietti R: Brain metastases from unknown primary tumour: a prospective study. J Neurol 248: 394-398, 2001.

11. Seidman JD, Elsayed AM, Sobin LH, Tavassoli FA: Association of mucinous tumors of the ovary and appendix. A clinicopathologic study of 25 cases. Am J Surg Pathol 17:32-34, 1993.

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