

# Brain Metastasis of Non-small Cell Lung Cancer Presenting as Sensorineural Hearing Loss and Vertigo

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We report a case of lung cancer with multiple metastases to the brain and internal auditory canal. A 59-year-old man complained about persistent and progressive vertigo for 3 weeks with rapidly developing left-sided hearing loss and tinnitus. Bilateral intact eardrums and unsteady gait were noted on physical examination. There was no nystagmus. Pure tone audiometry showed left-sided sensorineural hearing loss. Magnetic resonance imaging of the brain revealed multiple intracranial tumors, including of the left-side internal auditory canal, which were interpreted as seeding of metastatic malignancy. Computed tomographic and bronchoscopic biopsy identified an asymptomatic primary pulmonary adenocarcinoma in the right upper lobe of the lungs. This was a rare case of asymptomatic primary pulmonary adenocarcinoma with brain metastases presenting with sudden hearing loss and vertigo. [*J Chin Med Assoc* 2009;72(7):382–384]

**Key Words:** brain metastasis, lung adenocarcinoma, sudden hearing loss, vertigo

## Introduction

Sensorineural hearing loss and vertigo occur when there is damage to the inner ear (cochlea and vestibule) or to the nerve pathways from the inner ear to the brain (retrocochlear pathways). They may be caused by vascular problems, viral infections, autoimmune diseases, ototoxic medications, or genetic syndromes, or they may occur as a result of noise exposure, head trauma, aging, or, more seriously, tumors.<sup>1</sup> We report this case of asymptomatic primary pulmonary adenocarcinoma with brain metastases presenting as sudden hearing loss and vertigo.

## Case Report

The 59-year-old male patient came to our outpatient department for help with the chief complaint of episodic vertigo, dizziness with unsteady gait, left-sided tinnitus and hearing impairment of 3 weeks' duration.

No other neurologic symptoms were observed. There was neither history of previous malignancies nor clinical evidence of a current malignant tumor. Pure tone audiometry revealed left-sided sensorineural hearing loss (Figure 1).

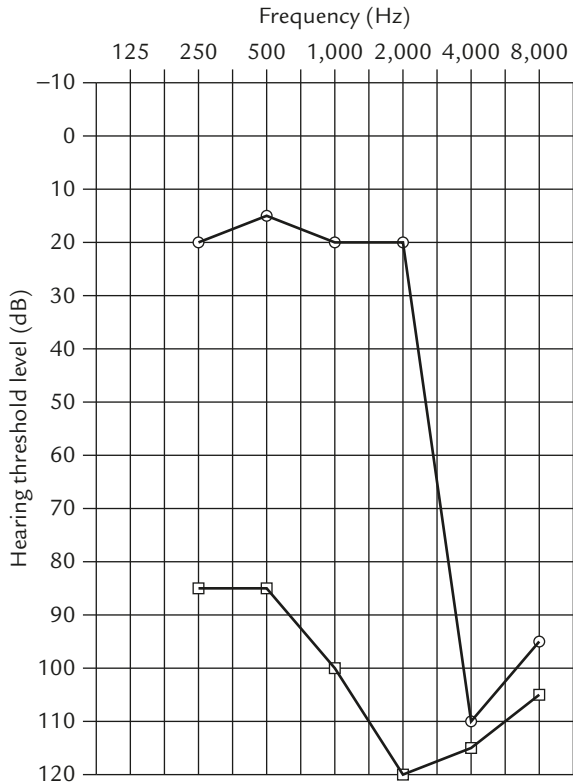
The patient was admitted under the tentative diagnosis of left-sided labyrinthitis. Routine chest X-ray showed a right suprahilar lobulated soft tissue mass and bilateral pulmonary nodules (Figure 2). Radiologically, these lesions were interpreted as malignancy with lung-to-lung metastasis. Further thoracic and upper abdominal computed tomographic scans revealed a space-occupying (6.5 × 5.5 cm), contrast-enhanced lesion in the right upper lung. Multiple small nodules, in favor of metastasis, were also found in both lung fields and bilateral adrenal glands (Figure 3).

Brain magnetic resonance imaging (MRI) was arranged to rule out central vertigo due to the persistent and progressive symptoms and revealed multiple enhanced nodules in the cerebrum, cerebellum, and left internal auditory canal (Figure 4). Bronchoscopic

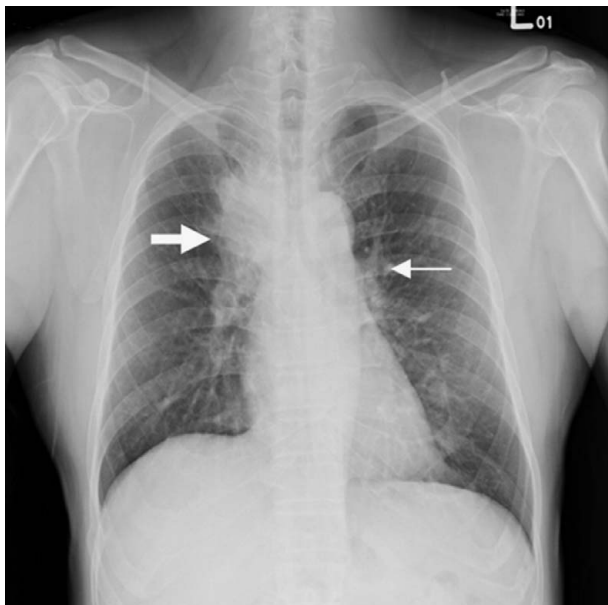


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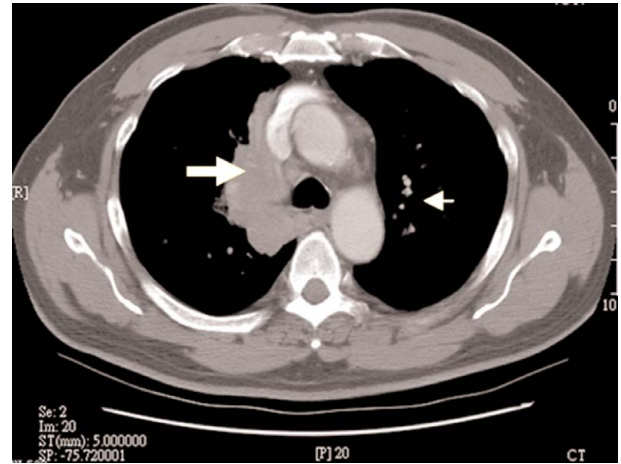


**Figure 1.** Pure tone audiometry shows left-sided sensorineural hearing loss.



**Figure 2.** Chest X-ray shows right suprahilar tumor (thick arrow) and contralateral nodule (thin arrow).

biopsy of the suprahilar mass confirmed pulmonary adenocarcinoma with clinical stage T3N3M1 (stage IV). Subsequently, chemoradiotherapy for primary tumor and metastatic lesions was arranged.



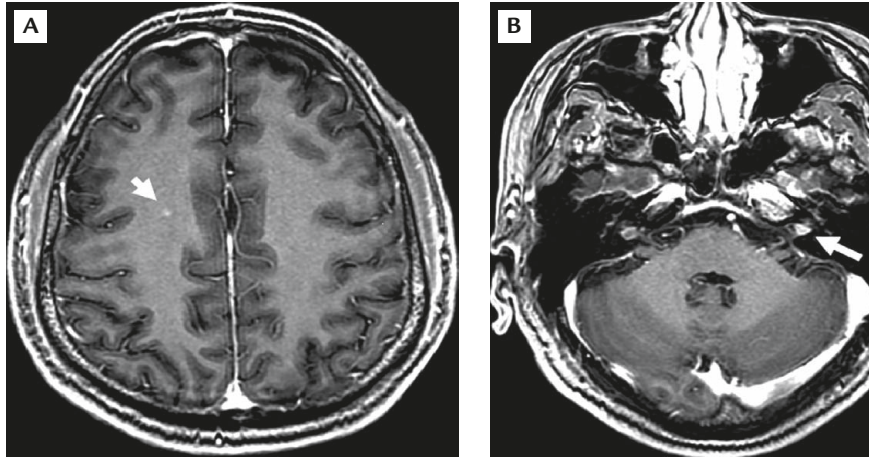
**Figure 3.** Computed tomography of the chest shows right upper lobe tumor (thick arrow) with suspected contralateral multiple metastatic nodules (thin arrow).

## Discussion

Sensorineural hearing loss and vertigo are very common complaints in otorhinolaryngologists' clinical experience. In most cases, the etiology is peripheral in origin and the symptoms are usually not aggravated after medical treatment or observation. Vestibular schwannoma is the most frequent lesion of the internal acoustic canal (IAC) and cerebello-pontine angle (CPA), and constitutes more than 80% of all lesions.

Primary metastasis to the IAC is rarely reported, representing only 0.3% of CPA lesions. The most common origin in temporal bone metastasis is adenocarcinoma of the breast (24.8%), followed by lung (11.3%), kidney (9.2%), stomach (6.4%), bronchus (6.4%), and prostate (5.7%).<sup>2</sup> There are 3 distinct routes of tumor spread from the primary tumor to the temporal bone: (1) hematogenous dissemination; (2) direct neoplastic extension from adjacent areas; and (3) diffuse metastatic leptomeningeal carcinomatosis when tumor cells gain access to the cerebrospinal fluid.

Only a few cases of metastasis of lung carcinoma to the IAC have been reported in the literature.<sup>3</sup> Krainik et al compared the radiological features of different types of CPA and IAC tumors.<sup>4</sup> They pointed out that the MRI features of metastases are similar to those of schwannomas except for the presence of thick linear and extranodular contrast enhancement. Nevertheless, their study did not allow for definition of precise radiological features that can be used to distinguish between CPA and IAC lesions, and so the diagnosis of malignancy should rely mainly on clinical signs and findings. Rapid development of symptoms point to a malignant neoplasm.



**Figure 4.** Magnetic resonance imaging of the brain shows: (A) hyperintense subcortical lesion (arrow); (B) hyperintense lesion in the internal acoustic canal (arrow).

Brain metastases, the most common intracranial tumor, have been reported to occur in 20–45% of patients with systemic cancer.<sup>5</sup> Among adults, the most common origins of brain metastasis include lung cancer (50%), breast cancer (15–20%), and melanoma (10%). Metastases from breast, colon, and renal cell carcinoma are often solitary, while melanoma and lung cancer have a greater tendency to lead to multiple metastases.<sup>6,7</sup> Most brain metastases arise from hematogenous spread, and thus the distribution of central nervous system metastases reflects the blood flow in the central nervous system, with 80% of metastases in the cerebrum, 15% in the cerebellum, and 5% in the brainstem and deep structures.<sup>5</sup> The majority of metastases are found in the parietal lobe as a result of the confluence of the 3 major cerebral arteries, followed by the frontal and occipital lobes.<sup>5,8</sup> Headache is a common presenting symptom, especially in patients with multiple lesions or with metastases in the posterior fossa. Cognitive disturbance and lateralizing symptoms, such as hemiparesis, aphasia and visual field disturbance, are common in most patients with brain metastases. Focal or generalized seizures, which are the presenting symptoms in approximately 10% of patients, are more common in patients with multiple lesions and in patients with melanoma metastases, occurring in 50% of melanoma patients. Some lesions (5–10%) present acutely with neurologic symptoms caused by hemorrhage into the tumor.<sup>7</sup> Vestibule-cochlear dysfunction, which was the only manifestation in our patient, is rarely reported as the first presenting symptom in brain metastasis.

Vestibular schwannoma is a slow-growing tumor that progresses over decades. In this case, sudden

onset of vertigo and hearing impairment developed in the previously healthy patient and progressed in spite of medical treatment. In addition to the clinical symptoms, multiple contrast-enhanced nodules in the brain, compatible with metastasis, were also found. In such patients without a known malignancy, sudden onset of inner ear-related symptoms might be the first sign of metastatic IAC disease.

In conclusion, when dealing with persistent vestibule-cochlear dysfunction, pathologies from central origins should be highly suspected and further evaluation undertaken.

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