

## Lower Cranial Nerve Palsy due to Prevertebral Tuberculosis Infection

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Prevertebral tuberculosis is a rare infectious disease that often affects immunocompromised patients in developing countries. We present the case of a patient who complained of headache, dysarthria, and dysphagia. Neurological examination revealed multiple cranial nerve palsies, including the hypoglossal, glossopharyngeal, and vagus nerves. Brain magnetic resonance imaging demonstrated an infiltrative lesion in the prevertebral space, and the biopsy revealed chronic inflammation. On suspicion of immune-mediated inflammation, the patient was treated with intravenous dexamethasone and oral prednisolone, with minimal response. Eleven months after the initial diagnosis, the patient's neurological symptoms were aggravated, and we detected newly developed pulmonary tuberculosis. After the treatment of pulmonary tuberculosis, his neurological symptoms improved, and the imaging study demonstrated improvements. Although we lacked positive laboratory or biopsy results for tuberculosis, we suspect that the lesions were distant tuberculosis infections. Tuberculosis should be considered in patients with unknown infiltrative mass-like lesions in the prevertebral spaces.

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Tuberculosis is one of the leading causes of death among infectious diseases worldwide. The Global Tuberculosis Report 2020 estimates 10.0 million new tuberculosis cases with 1.4 million deaths due to the disease.<sup>1</sup> In Korea, despite active tuberculosis control and prevention activities, the disease remains a serious public health burden. Korea has a higher tuberculosis incidence and mortality rate compared to the Organization for Economic Co-operation and Development average.<sup>2</sup> Extrapulmonary manifestations of the disease comprise 20% of all cases, with head and neck tuberculosis accounting for 10%.<sup>3</sup>

Clinical manifestations and imaging of tuberculosis in the head and neck are highly similar to those of inflammation or neoplasm, making the differential diagnosis difficult and causing a delay in making a correct diagnosis.<sup>4</sup> Even when tuberculosis is suspected, diagnosing the disease is challenging because of either low sensitivity of PCR and culture or low specificity of the

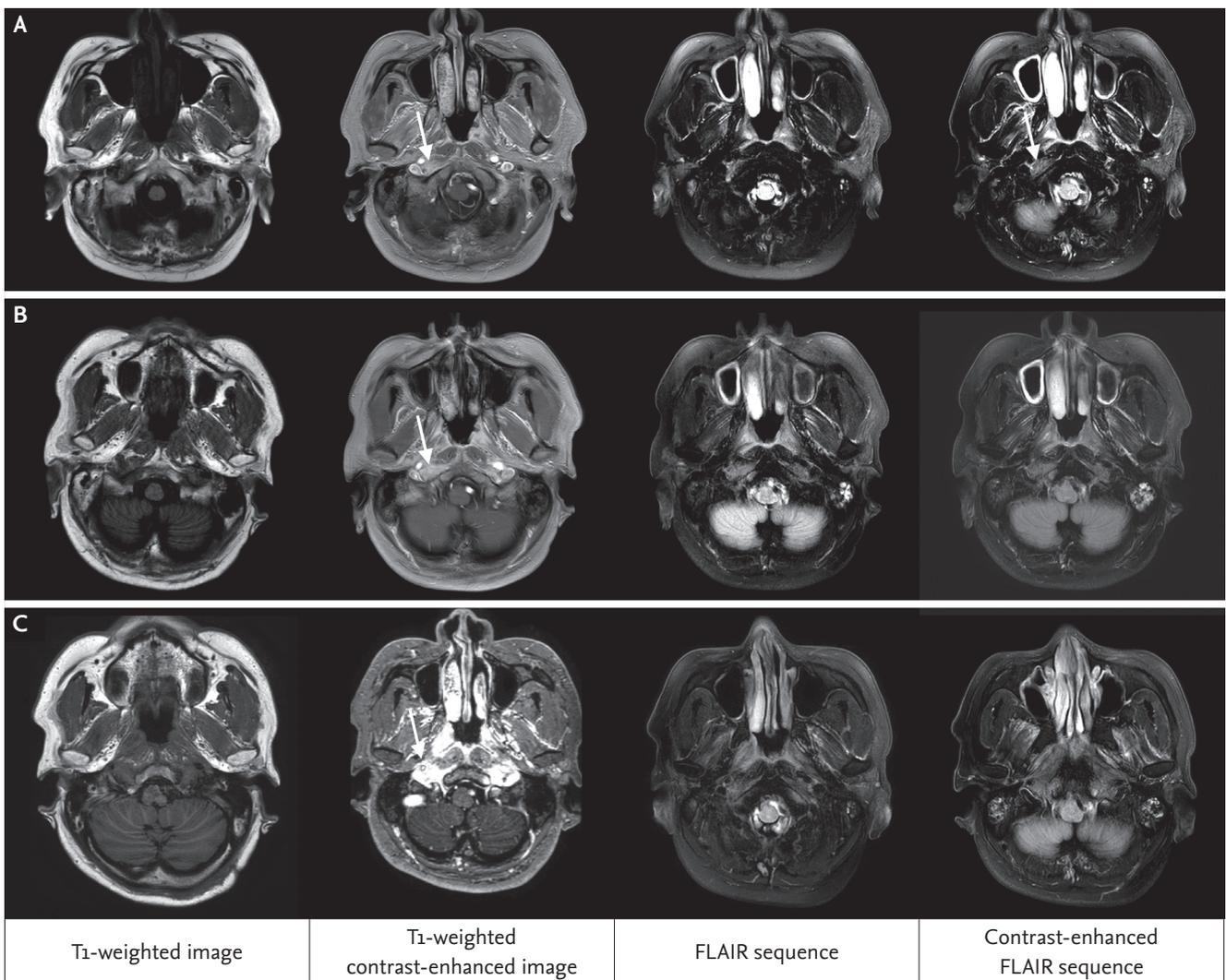
interferon-gamma-release assay and histopathology.<sup>5</sup> We present a challenging case of tuberculosis infection of the prevertebral space in a patient with unilateral lower cranial nerve palsy and negative biopsy results.

### CASE

A 49-year-old male was admitted to the gastroenterology department due to hematochezia from internal hemorrhoids, with a complaint of dysarthria and headache. He was referred for consultation to the neurology department, and upon examination, the patient had subtle dysarthria but demonstrated no other neurological deficits. Brain computed tomography (CT), neck CT angiography (CTA), and brain magnetic resonance imaging (MRI) were performed, but the prevertebral lesion was dismissed (Fig. 1A). The patient was discharged and scheduled for a follow-up in the outpatient department.

One month after discharge, the patient reported to the emergency department complaining of worsening dysarthria and right temporal headache. A neurologic examination revealed that the patient had dysarthria, with marked tongue deviation to the right and uvula deviation to the left. The patient also reported a change in taste in the right posterior third of the tongue. The patient's pain aggravated when he turned his head to the right side. Brainstem MRI with contrast revealed a newly developed diffuse infiltrative lesion at the bilateral recess of the nasopharynx and prevertebral space (right dominant) and focal cortical erosion with

marrow signal change in the right anterior clivus (Fig. 1B). Radiological findings indicated infiltrative pathologies such as immunoglobulin G (IgG)<sub>4</sub>-related disease, malignancy, or infection. Cerebrospinal fluid examination demonstrated colorless clear fluid, normal opening pressure (162 mmH<sub>2</sub>O), no pleocytosis, and normal protein (40.8 mg/dL) and glucose levels (57 mg/dL) compared with the serum glucose level (101 mg/dL). IgG subtype analysis was within the normal range, and protein electrophoresis revealed an acute inflammatory and physiological stress type pattern. The patient had an elevated white blood cell count of 12,100/mm<sup>3</sup>



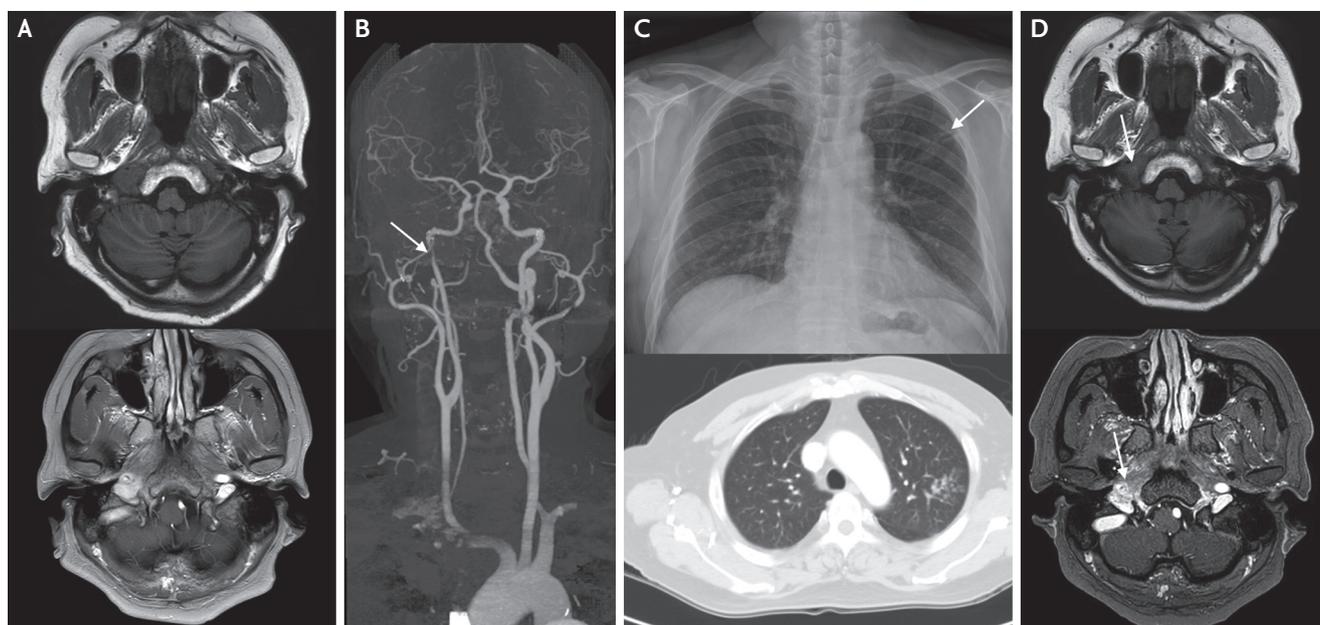
**FIG. 1.** (A) Serial brain magnetic resonance imaging (MRI) findings of the patient. Initial brain MRI demonstrates subtle enhancement of the right prevertebral space on T<sub>1</sub>-weighted contrast-enhanced MRI and contrast-enhanced fluid-attenuated inversion recovery sequence (white arrows). (B) Follow-up brain MRI after one month shows a prominent enhancement on T<sub>1</sub>-weighted contrast-enhanced MRI (white arrow). (C) Brain MRI after three months follow-up shows severe inflammation, encasing the right internal carotid artery (white arrow).

and mildly elevated C-reactive protein level of 1.29 mg/dL. The patient underwent an open biopsy of the right prevertebral lesion via transnasal endoscopic surgery, and the histopathology revealed chronic inflammation without tumor cells. Thus, intravenous dexamethasone was administered for three days and tapered according to the schedule. After dexamethasone administration, he demonstrated mild improvement in neurological symptoms.

Two months later, the patient was readmitted because of worsening dysarthria and dysphagia. Follow-up MRI revealed mild aggravation of the previously noted infiltrative lesion at the bilateral lateral recess of the nasopharynx prevertebral space and carotid space. Both internal carotid arteries (ICA) were encased in the lesion, with possible narrowing of the right ICA (Fig. 1C). The second biopsy was performed from the right anterior clivus, and immunohistochemical staining revealed IgG4 positive cells, with a count of 2/high power field. On suspicion of IgG4-related disorder, the patient was treated with intravenous dexamethasone, but his neurological symptoms such as dysarthria, dysphagia, and facial pain persisted with minimal improvement. The

patient was discharged with oral prednisolone therapy.

The patient remained relatively stable with fluctuating symptoms, which were partially controlled with oral prednisolone medication. However, 11 months after his admission, the patient was readmitted because of aggravating pain, dysarthria, hoarseness, and dysphagia. A follow-up neurological examination demonstrated the absence of gag reflex, worsened tongue deviation to the right, and uvula deviation to the left, which resulted in dysarthria and dysphagia. The patient did not have facial palsy, sensory changes, or motor weakness. Brain MRI demonstrated an interval decrease in the previously noted infiltration and a newly developed, round, enhancing lesion, focally encasing the distal right cervical ICA with narrowing of the carotid artery (Fig. 2A). Neck CTA was performed to evaluate the ICA, and a newly developed nodular lesion in the left upper lung field was noted (Fig. 2B). Subsequent chest X-ray and CT presented active pulmonary tuberculosis in the apicoposterior segment of the left upper lobe (Fig. 2C). Because the patient had no other signs of central nervous system infection, we decided that tuberculosis treatment was the priority in disease management.



**FIG. 2.** Image findings before and after tuberculosis treatment. (A) Brain magnetic resonance imaging (MRI) demonstrates inflammatory changes in the prevertebral spaces and narrowing of the internal carotid artery. (B) Neck computed tomography (CT) angiography demonstrates significant narrowing of the right cervical segment of the internal carotid artery (white arrow). (C) Chest radiograph and CT shows a nodular lesion in the left upper lung field (white arrow). (D) Follow-up MRI after one month of anti-tuberculosis medication shows a slightly improved enhancing lesion (white arrows).

Instead of an additional cerebrospinal fluid (CSF) study or other examinations, the patient was immediately started with oral tuberculosis medication, including rifampicin, ethambutol, isoniazid, and pyrazinamide. His neurological symptoms gradually improved, and the follow-up brain MRI one month after pulmonary tuberculosis treatment revealed an interval decrease in the newly developed lesion and improvement in the right ICA stenosis (Fig. 2D).

## DISCUSSION

The patient had multiple lower cranial nerve palsies, including the glossopharyngeal, vagus, and hypoglossal nerves due to an ambiguous inflammation. His neurological symptoms demonstrated a poor response to corticosteroid therapy, and tuberculosis medication dramatically improved the symptoms. Although the patient's biopsy results did not reveal caseous necrosis, we suspected that the infiltrative lesions in the prevertebral space and cervical carotid artery shown on MRI were associated with tuberculosis infection. The lesion itself could be a tuberculosis infection or tuberculosis-associated distant immune-mediated inflammation.

Even though tuberculosis was on the differential diagnosis list, it took approximately 11 months to diagnose the condition. The Republic of Korea has a high tuberculosis incidence rate despite the government's aggressive programs, including control of non-compliance, insurance coverage for wide screening, diagnosis, and treatment.<sup>6</sup> Therefore, the possibility of tuberculosis is often considered as a differential diagnosis in infectious diseases. Nonetheless, tuberculosis infection was not a primary diagnosis because of the infection's location and the patient's demographic profile. Tuberculosis infection in the head and neck is rare,<sup>37</sup> but the patient was relatively young and healthy, with no indications of an immunosuppressive state. It is known that tuberculosis is likely to affect elderly patients with an immunosuppressive state.<sup>8</sup> Most importantly, the patient's MRI, laboratory study including the CSF analysis, and the biopsy results were negative for tuberculosis. In addition, the diagnosis of pulmonary tuberculosis was delayed because we could not find a pulmonary lesion on the simple chest X-ray during follow-up, and

his cough was believed to be associated with nasopharyngeal discomfort.

According to the official Centers for Diseases Control and Prevention Clinical Practice Guidelines, amenable fluid specimens from the sites of suspected lesions should be collected for cell counts and laboratory studies to diagnose extrapulmonary tuberculosis.<sup>9</sup> More specifically, acid-fast bacilli smear, mycobacterial culture, nucleic acid amplification test (NAAT), and histological examination are recommended for diagnosis of extrapulmonary tuberculosis. Bacterial culture is the gold standard for the diagnosis of tuberculosis, and various diagnostic tools are also available which are under study.<sup>10</sup> The patient underwent biopsy twice, but we did not use the biopsy samples for tuberculosis culture or NAAT. MRI revealed a lesion in the prevertebral space, which resembled chronic inflammation rather than an acute infection. If we had considered tuberculosis culture and NAAT beforehand, prevertebral space tuberculosis might have been diagnosed earlier. Hence, one should remember that tuberculosis infection could be present in the prevertebral space and proactively consider tuberculosis culture of the infiltrative lesion whenever it is suspected, even when the possibility of tuberculosis seems low.

### Ethics statement

This study was approved by the Institutional Review Board (IRB) of the Hanyang University Hospital (IRB No. HYUH 2021-10-039). The requirement for informed consent was waived by the IRB.

### Availability of Data and Material

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### Conflicts of Interest

No potential conflicts of interest relevant to this article was reported.

## REFERENCES

1. Chakaya J, Khan M, Ntoumi F, Aklillu E, Fatima R, Mwaba P, et al. Global tuberculosis report 2020 - reflections on the global TB burden, treatment and prevention efforts. *Int J Infect Dis* 2021;113 Suppl 1(Suppl 1):S7-S12.
2. Go U, Park M, Kim UN, Lee S, Han S, Lee J, et al. Tuberculosis prevention and care in Korea: Evolution of policy and practice. *J Clin Tuberc Other Mycobact Dis* 2018;11:28-36.
3. Kulchavenya E. Extrapulmonary tuberculosis: are statistical reports accurate? *Ther Adv Infect Dis* 2014;2:61-70.
4. Sheikh S, Pallagatti S, Gupta D, Mittal A. Tuberculous osteomyelitis of mandibular condyle: a diagnostic dilemma. *Dentomaxillofac Radiol* 2012;41:169-174.
5. Ellison E, Lapuerta P, Martin SE. Fine needle aspiration diagnosis of mycobacterial lymphadenitis. Sensitivity and predictive value in the United States. *Acta Cytol* 1999;43:153-157.
6. Cho KS. Tuberculosis control in the republic of Korea. *Epidemiol Health* 2018;40:e2018036.
7. Brucoli M, Borello G, Boffano P, Benech A. Tuberculous neck lymphadenopathy: a diagnostic challenge. *J Stomatol Oral Maxillofac Surg* 2019;120:267-269.
8. Gehrke T, Hackenberg S, Teclé N, Hagen R, Scherzad A. Tuberculosis in the head and neck: changing trends and age-related patterns. *Laryngoscope* 2021;131:2701-2705.
9. Lewinsohn DM, Leonard MK, LoBue PA, Cohn DL, Daley CL, Desmond E, et al. Official American Thoracic Society/ Infectious Diseases Society of America/Centers for Disease Control And Prevention clinical practice guidelines: diagnosis of tuberculosis in adults and children. *Clin Infect Dis* 2017;64:111-115.
10. Chakravorty S, Sen MK, Tyagi JS. Diagnosis of extrapulmonary tuberculosis by smear, culture, and PCR using universal sample processing technology. *J Clin Microbiol* 2005;43:4357-4362.