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CASE REPORT

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# Clival Osteomyelitis and Abscess Leading to Bilateral Pontine Infarction and Basilar Artery Pseudoaneurysm

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Brainstem infarction can be a critical condition, typically due to ischemic mechanisms such as large artery atherosclerosis, small vessel disease, or cardioembolic sources. In rare instances, infectious or inflammatory etiologies may lead to brainstem infarction, posing substantial diagnostic complexities. We report the case of a 74-year-old man presenting bilateral pontine infarctions secondary to clival osteomyelitis and an adjacent abscess, which was further complicated by a basilar artery pseudoaneurysm and subsequent subarachnoid hemorrhage. This case highlights the importance of considering uncommon infectious causes of brainstem infarction, especially in patients with intricate medical backgrounds and immunosuppression.

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Brainstem infarction represents a severe condition frequently associated with considerable morbidity and mortality. It commonly results from ischemic events in the brainstem due to large-artery atherosclerosis, small-vessel disease, or cardioembolic sources. Nevertheless, in rare instances, other etiologies such as infectious or inflammatory processes, may precipitate brainstem infarction.[1] These cases are particularly challenging to diagnose and manage due to their uncommon nature, often resulting in delayed diagnosis despite the potential for rapid progression to profound neurological deficits.

Infectious complications involving the clivus and adjacent anatomical structures, though infrequent, are crucial to recognize. These infections can lead to brainstem infarction and other life-threatening conditions.[2] Inflammatory and infectious processes within this region may also cause vascular complications, such as pseudoaneurysm formation, which markedly heightens the risk of fatal outcomes.[3] The development of a pseudoaneurysm in the context of an adjacent infection is a complex and high-risk pathology, necessitating timely identification and intervention.

Prompt identification and management of the infectious and vascular complications are essential to improve outcomes. Despite their rarity, such entities should be considered in the differential diagnosis of brainstem infarction, particularly in individuals with predisposing factors, such as immunosuppression.

This report describes the case of a 74-year-old man with chronic medical issues, including recent cancer treatment, who developed bilateral pontine infarction from clival osteomyelitis and an adjacent abscess, complicated by a basilar artery pseudoaneurysm. This case highlights the need to consider infectious and vascular causes of brainstem infarction, particularly in patients with multiple risk factors.

## CASE

A 74-year-old man with a history of hypertension, dyslipidemia, chronic kidney disease, and left parotid gland cancer was presented to the emergency department with sudden-onset right hemiparesis. Six months later, he had been diagnosed with left parotid gland cancer and had undergone surgical resection, followed by chemotherapy

with vinorelbine and cisplatin for lung metastases.

On admission, his vital signs were as follows: blood pressure 145/81 mmHg, pulse rate 86 beats per minute, respiratory rate 16 breaths per minute, body temperature 36.8°C, and oxygen saturation 99%. Laboratory tests revealed a white blood cell (WBC) count of 4,820/μL, hemoglobin level of 9.1 g/dL, and platelet count of 219,000/μL. The serum sodium concentration was low at 129 mmol/L. Blood urea nitrogen was 21.7 mg/dL, creatinine 1.43 mg/dL, and the estimated glomerular filtration rate was 48 ml/min/1.73 $m^2$, consistent with previous results. C-reactive protein level was mildly elevated at 8.2 mg/L. Given the sudden hemiparesis, a cerebrovascular accident was suspected, and imaging was performed. Brain computed tomography (CT) with angiography showed no significant findings. However, diffusion-weighted magnetic resonance imaging (MRI) revealed bilateral pontine infarctions (Fig. 1A).

Dual antiplatelet therapy and statins were initiated for ischemic stroke management. Although his symptoms remained stable, follow-up MRI on the third day revealed sphenoid sinusitis and clival osteomyelitis with a 1.5-cm adjacent abscess on T1 weighted gadolinium enhanced images. The abscess was closely associated with the basilar artery and right anterior inferior cerebellar artery (Fig. 1B, 1C), suggesting that inflammation likely contributed to bilateral pontine infarction. A cerebrospinal fluid (CSF) study showed an opening pressure of 220 $mmH_2O$ with a WBC count of 418 cells/μL (61% polymorphonuclear cells, 15% lymphocytes, and 24% monocytes).

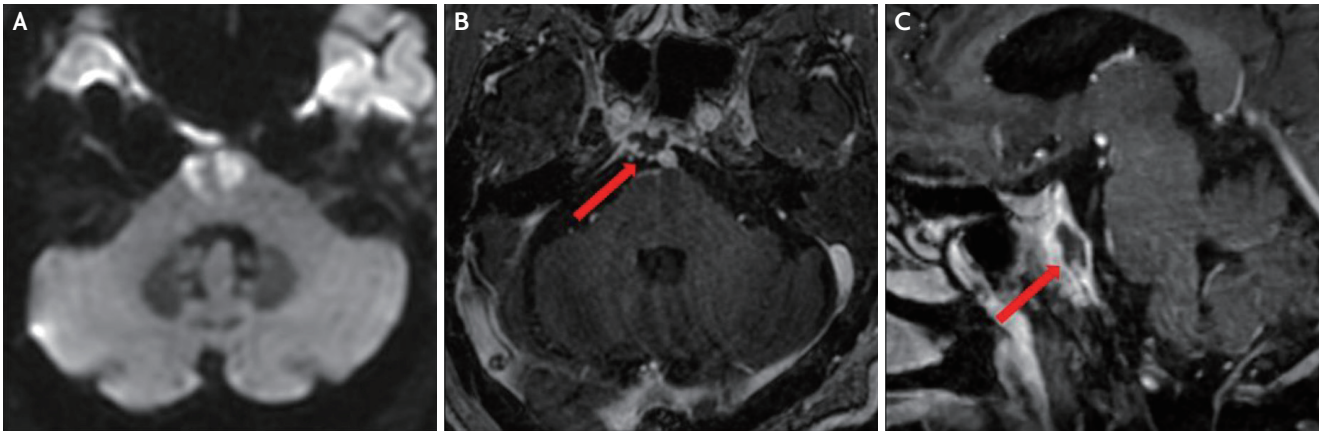


**Fig. 1.** (A) Diffusion-weighted MRI on the initial day showing bilateral pontine infarction. (B, C) T1-weighted contrast-enhanced MRI taken on the 3rd day, demonstrating clival osteomyelitis with contrast enhancement and a rim-enhanced abscess in close proximity to the basilar artery (red arrow). MRI, magnetic resonance imaging.

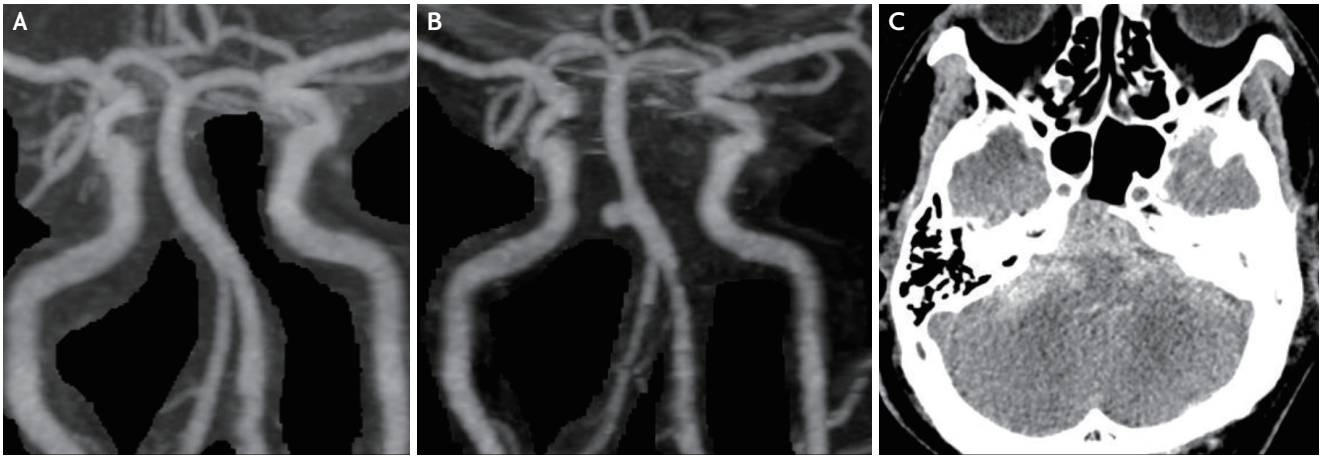


**Fig. 2.** (A) CT angiography on the initial day. (B) CT angiography on the 12th day, showing a newly developed basilar artery pseudoaneurysm. (C) CT scan on the 12th day, revealing findings consistent with subarachnoid hemorrhage. CT, computed tomography.

Blood and CSF cultures did not identify any pathogens. Treatment with ceftazidime, vancomycin, and metronidazole was initiated, and the patient remained stable. Surgical treatment of the abscess was planned. The patient's blood pressure was well controlled, with systolic readings consistently below 140 mmHg. However, on the 12th day of hospitalization and 8th day of antibiotic therapy, the patient experienced a sudden change in mental status, followed by respiratory distress. Brain CT angiography revealed a subarachnoid hemorrhage and basilar artery aneurysm (Fig. 2). The basilar artery aneurysm, which had developed rapidly over 12 days, was associated with adjacent infection and inflammation, leading to the diagnosis of a pseudoaneurysm. Despite aggressive medical therapy, the patient did not recover from coma and died on the 14th day of hospitalization.

## DISCUSSION

This report presents a rare and complex case of bilateral pontine infarction caused by clival osteomyelitis and an adjacent abscess, further complicated by a basilar artery pseudoaneurysm. The patient's medical history, including chronic kidney disease, hypertension, dyslipidemia, and recent treatment for left parotid gland cancer, likely increased his vulnerability to infectious and vascular complications. Immunosuppression from chemotherapy may have further predisposed the patient to these severe infections and subsequent vascular issues, such as the pseudoaneurysm observed in this case.[4]

In this case, brainstem infarcts stemmed from an infectious process in the clivus rather than from more common vascular causes. The proximity of the abscess to critical arteries likely contributes to infarction, emphasizing the importance of considering infectious origins in patients with a complex medical history or immunosuppression.

The development of basilar artery pseudoaneurysms is particularly notable. Pseudoaneurysms are uncommon, and when infection-related, they are often referred to as mycotic pseudoaneurysms.[5-7] These aneurysms arise from infection-induced weakening of the arterial wall, leading to localized outpouching and a high risk of rupture. In this case, the proximity of the abscess to the basilar artery likely facilitated the formation of the pseudoaneurysm, ultimately resulting in a fatal subarachnoid hemorrhage.

Diagnosing clival osteomyelitis and its complications is challenging because of its rarity. In this case, right hemiparesis initially prompted a stroke workup, revealing pontine infarction; however, the infectious cause was only identified on further imaging. This delay underscores the need for a high index of suspicion for infectious causes in patients with stroke and complex medical histories or unusual infarction patterns.

This patient was managed using a multidisciplinary approach, including broad-spectrum antibiotics and planned surgical intervention for the abscess. Despite efforts to control the infection and stabilize the patient, the condition deteriorated rapidly owing to rupture of the basilar artery pseudoaneurysm, underscoring the aggressive nature of this complication. The outcome was ultimately fatal, reflecting the poor prognosis associated with serious vascular complications.

In conclusion, this case illustrates the complexity of diagnosing and managing rare causes of brainstem infarction and the risk of severe vascular complications, such as pseudoaneurysm formation. Clinicians should maintain a high index of suspicion for infectious and vascular causes of stroke in patients with atypical presentations or underlying risk factors, particularly in those who are immunosuppressed due to cancer treatment or other factors. Early recognition and intervention are critical to improve outcomes in these challenging cases.

### Ethics Statement

This case report was approved with a waiver of informed consent by the Severance Hospital, Yonsei University Health System Institutional Review Board (IRB No. 3-2024-0188).

### Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

### Author Contributions

Minsoo Sung wrote the first draft; Yo Han Jung and Kyung-Yul Lee critically reviewed the manuscript; Kyung-Yul Lee supervised the project. All authors have read and approved the final manuscript.

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None.

**Conflicts of Interest**

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

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