

## Case Report

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# Surgical management of temporal lobe intracerebral hemorrhage presenting with bilateral deafness: a case report

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Temporal lobe intracerebral hemorrhage (ICH) causing bilateral sensorineural hearing loss (SNHL) is considered rare. However, there are a few reports regarding the treatment of this condition, most of which have described the use of conservative treatment. We herein report the surgical outcome of a 58-year-old patient diagnosed with temporal lobe ICH presenting with bilateral SNHL. A 58-year-old male presented to our hospital complaining of bilateral deafness. Pure tone audiometry (PTA) revealed bilateral SNHL. He had a history of spontaneous ICH in the left temporal lobe region 2 years previously. Following routine intravenous dexamethasone, the patient was screened with brain magnetic resonance imaging. Imaging showed subcortical ICH (3.4×2.5×4.0 cm<sup>3</sup>) in the right temporal lobe area. Further physical examination did not reveal any neurologic deficits other than deafness. He underwent surgery for ICH removal. Postoperative computed tomography confirmed that the ICH was removed. After surgery, his symptoms and follow-up PTA showed improvement on both sides within 2 days. Bilateral SNHL due to ICH is rare and has a poor prognosis. However, surgery may be an appropriate treatment for bilateral SNHL.

**KEY WORDS:** Cerebral hemorrhage, Hearing Loss, Hearing, Auditory pathways

## INTRODUCTION

Intracerebral hemorrhage (ICH) causes a neurologic syndrome associated with its location and volume [1]. However, neurological symptoms, such as altered consciousness and motor weakness, usually caused by cerebral hemorrhage, are one-sided [2].

Temporal lobe ICH comprises approximately 5% of cerebral hemorrhage cases [3]. Patients with temporal ICH usually present with headache, paraphasia, and speech or comprehension problems [4]. Both sensorineural hearing loss (SNHL) types due to ICH are considered rare. This case highlights a patient with hearing loss, after sequential history of cerebral hemorrhage. We report on a surgical treatment for ICH and SNHL without other neurologic symptoms as well as the clinical outcome after surgical removal.

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## CASE REPORT

A 58-year-old male patient came to the emergency center with sudden bilateral hearing loss. The patient had a history of spontaneous ICH in the left temporal lobe region extending to the putamen and corona radiata, 2 years ago. The tympanic membrane appeared intact. Pure tone audiometry (PTA) and otoacoustic emission test revealed bilateral SNHL (Fig. 1). While we administered routine intravenous dexamethasone treatment for sudden SNHL, computed tomography (CT) and magnetic resonance imaging (MRI) showed subcortical ICH (4.0 cm) in the right temporal lobe area (Fig. 2A, B). Further physical examination did not show any neurologic deficits other than deafness. The patient underwent navigation-guided-craniotomy for ICH removal. Postoperative CT confirmed ICH was removed (Fig. 2C). After surgery, his symptoms and PTA improved in 2 days. During the follow-up, the patient's symptoms improved to serviceable hearing (Fig. 1).

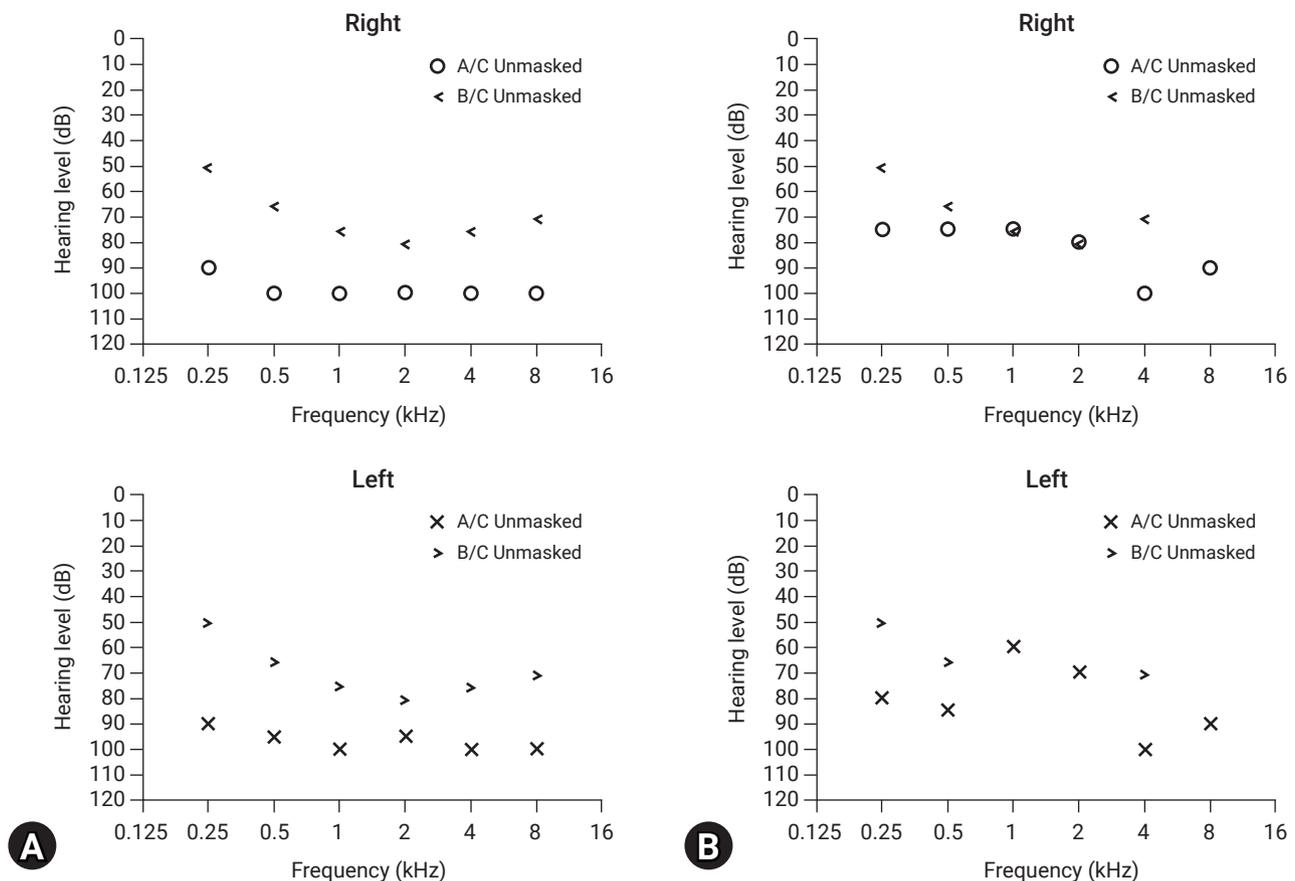
## Ethical Statements

This study was approved by the Institutional Review Board (IRB) of the Chuncheon Sacred Heart Hospital (IRB No: 2021-06-012). Written informed consent was obtained from the patient.

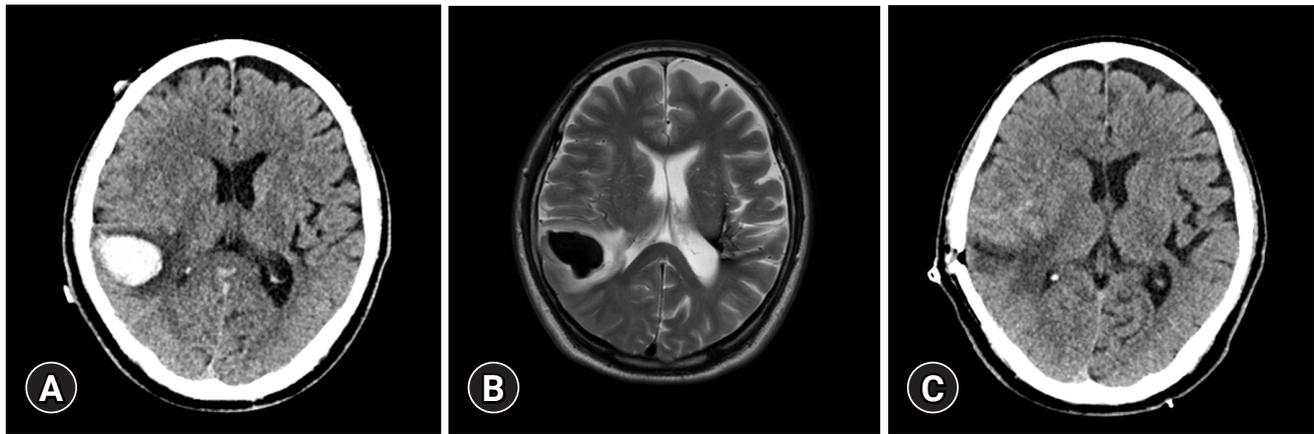
## DISCUSSION

ICH causes various neurological symptoms, such as seizures, motor weakness, and aphasia. While symptoms of cerebral hemorrhage are often associated with neuroanatomical structures, it is rare to have only bilateral SNHL.

Hearing loss due to ICH could be explained by the auditory pathway. Sound stimulates hair cells in the organ of Corti. These nerves enter the brain stem and bifurcate, connecting the dorsal and ventral cochlear nuclei. The pathway enters the inferior colliculus, intersecting at the superior Olive complex. After the inferior colliculus, the signal is transmitted to the cortex located in the



**Fig. 1.** The pure tone audiometry test results before and after surgery were compared to confirm that the patient's symptoms improved to a serviceable hearing level. (A) Preoperative pure tone audiometry shows bilateral sensorineural hearing loss (HL). (B) Postoperative pure tone audiometry conducted 2 days after surgery shows bilateral sensorineural HL recovery to a serviceable hearing level. A/C: air conduction, B/C: bone conduction.



**Fig. 2.** Preoperative examinations. (A) Computed tomography shows subcortical intracranial hemorrhage ( $3.4 \times 2.5 \times 4.0 \text{ cm}^3$ ) in the right temporal lobe area. (B) Subcortical intracranial hemorrhage ( $3.4 \times 2.5 \times 4.0 \text{ cm}^3$ ) shows low T2 signal intensity on magnetic resonance imaging. Perihematomal swelling shows high T2 signal intensity. (C) Postoperative computed tomography shows complete removal of the subcortical intracranial hemorrhage.

superior temporal lobe gyrus (auditory area) through the medial geniculate body [5]. Due to the intersections of the auditory system, symptoms appear to occur on both sides, even with one-sided lesions [6].

Sudden hearing loss may have various etiologies, such as viral infections, ototoxic drugs, and autoimmune diseases. Among them, central origins, such as hemorrhage or infarct, could be a cause of SNHL [7,8]. In most cases where patients received conservative treatment for ICH with SNHL, the prognosis was poor.

Kim et al. [6] reported a case of pontine hemorrhage with bilateral SNHL. In that case, after conservative treatment, PTA from 52 months of onset did not show definite improvement.

Surgical evacuation of hematoma is still controversial. However, in certain situations, hematoma removal through surgical treatment may be beneficial to the patient.

In this case, we performed surgery as opposed to other cases. The patient's prognosis improved to the restoration of serviceable hearing. However, some symptoms may advance due to the improvement of edema and inflammation after surgery.

ICH causes edema and secondary neuronal damage [9]. Thus, direct nerve injury or compression by edema block signals from both auditory pathways and triggers bilateral SNHL. If complications are properly controlled, hematoma removal prevents secondary neurological damage by relieving local ischemia or removing of noxious chemicals. If the hematoma is localized to the subcortex, as in this case, complications are unlikely to occur. When, treating symptoms caused by compression rather than structural damage, surgery should be considered, as it has the highest chance

of improving clinical outcomes.

Matsuda et al. [10] reported a case of cerebellar hemorrhage with right side SHNL. Wherein, craniotomy was performed, and an improvement in the SNHL was observed on the 6-month follow-up PTA. Our report highlights a rare case of ICH with bilateral SNHL and a basis for surgical treatment.

The main limitation of this case was that it was not clear whether the patient's improvement was due to surgical treatment or steroid treatment. After steroid treatment, hearing improves in about 70% of patients between 4 and 7 days of age [11]. However, in this case, the patient's SNHL immediately improved at 2 days after surgery; therefore, it is likely that decompression by surgery enhances clinical outcomes.

While further research is needed, we suggest that some of the temporal lobe ICH can cause bilateral SNHL, in which case surgery may be a suitable option to improve the prognosis if the patient's general condition is good.

## CONCLUSION

Temporal lobe ICH may be a rare cause of bilateral SNHL. Early surgical removal of hematoma could be an effective-treatment option to improve SNHL.

## CONFLICTS OF INTEREST

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

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