

World Journal of *Clinical Cases*

World J Clin Cases 2022 May 26; 10(15): 4713-5123



Contents

Thrice Monthly Volume 10 Number 15 May 26, 2022

EDITORIAL

- 4713 Diet and intestinal bacterial overgrowth: Is there evidence?

Souza C, Rocha R, Cotrim HP

MINIREVIEWS

- 4717 Definition and classification of acute-on-chronic liver diseases

Zhang YY, Meng ZJ

- 4726 Management of neurosurgical patients during coronavirus disease 2019 pandemics: The Ljubljana, Slovenia experience

Velmar T, Bosnjak R

ORIGINAL ARTICLE

Clinical and Translational Research

- 4737 Glycolytic and fatty acid oxidation genes affect the treatment and prognosis of liver cancer

Zou JY, Huang YJ, He J, Tang ZX, Qin L

- 4761 Detection of a novel panel of 24 genes with high frequencies of mutation in gastric cancer based on next-generation sequencing

Zeng HH, Yang Z, Qiu YB, Bashir S, Li Y, Xu M

Case Control Study

- 4776 Outcomes of cervical degenerative disc disease treated by anterior cervical discectomy and fusion with self-locking fusion cage

Zhang B, Jiang YZ, Song QP, An Y

- 4785 Impact of COVID-19 pandemic on clinicopathological features of transplant recipients with hepatocellular carcinoma: A case-control study

Akbulut S, Sahin TT, Ince V, Yilmaz S

Retrospective Study

- 4799 Risk factors and optimal predictive scoring system of mortality for children with acute paraquat poisoning

Song Y, Wang H, Tao YH

- 4810 Application effect of thoracoscopic tricuspid valvuloplasty in geriatric patients with tricuspid valve disease

Jiang W, Long XM, Wei KQ, Li SC, Zhang Z, He BF, Li H

- 4818 Endoscopic ultrasonography in the evaluation of condition and prognosis of ulcerative colitis

Jin RF, Chen YM, Chen RP, Ye HJ

- 4827** Dynamic interaction nursing intervention on functional rehabilitation and self-care ability of patients after aneurysm surgery

Xie YE, Huang WC, Li YP, Deng JH, Huang JT

Clinical Trials Study

- 4836** Validations of new cut-offs for surgical drains management and use of computerized tomography scan after pancreatoduodenectomy: The DALCUT trial

Caputo D, Coppola A, La Vaccara V, Passa R, Carbone L, Ciccozzi M, Angeletti S, Coppola R

Observational Study

- 4843** Psychosocial adaptation and influencing factors among patients with chemotherapy-induced peripheral neuropathy

Zhou X, Wang DY, Ding CY, Liu H, Sun ZQ

META-ANALYSIS

- 4856** Outcome of the efficacy of Chinese herbal medicine for functional constipation: A systematic review and meta-analysis

Lyu Z, Fan Y, Bai Y, Liu T, Zhong LL, Liang HF

CASE REPORT

- 4878** Familial gastrointestinal stromal tumors with *KIT* germline mutation in a Chinese family: A case report

Yuan W, Huang W, Ren L, Xu C, Luan LJ, Huang J, Xue AW, Fang Y, Gao XD, Shen KT, Lv JH, Hou YY

- 4886** Nonfunctional pancreatic neuroendocrine tumours misdiagnosed as autoimmune pancreatitis: A case report and review of literature

Lin ZQ, Li X, Yang Y, Wang Y, Zhang XY, Zhang XX, Guo J

- 4895** Sudden deafness as a prodrome of cerebellar artery infarction: Three case reports

Li BL, Xu JY, Lin S

- 4904** Importance of abdominal X-ray to confirm the position of levonorgestrel-releasing intrauterine system: A case report

Maebayashi A, Kato K, Hayashi N, Nagaishi M, Kawana K

- 4911** Bedside ultrasonic localization of the nasogastric tube in a patient with severe COVID-19: A case report

Zhu XJ, Liu SX, Li QT, Jiang YJ

- 4917** Paradoxical herniation after decompressive craniectomy provoked by mannitol: A case report

Du C, Tang HJ, Fan SM

- 4923** Targeted next-generation sequencing identifies a novel nonsense mutation in ANK1 for hereditary spherocytosis: A case report

Fu P, Jiao YY, Chen K, Shao JB, Liao XL, Yang JW, Jiang SY

- 4929** Nonfunctional bladder paraganglioma misdiagnosed as hemangioma: A case report

Chen J, Yang HF

- 4935** Special type of Wernekink syndrome in midbrain infarction: Four case reports
Yang YZ, Hu WX, Zhai HJ
- 4942** Primary extraskeletal Ewing's sarcoma of the lumbar nerve root: A case report
Lei LH, Li F, Wu T
- 4949** Yellow nail syndrome accompanied by minimal-change nephrotic syndrome: A case report
Zhang YN, Wang MH, Yu WC, Cheng W, Cong JP, Huang XP, Wang FF
- 4957** Total femur replacement with 18 years of follow-up: A case report
Yang YH, Chen JX, Chen QY, Wang Y, Zhou YB, Wang HW, Yuan T, Sun HP, Xie L, Yao ZH, Yang ZZ
- 4964** Male metaplastic breast cancer with poor prognosis: A case report
Kim HY, Lee S, Kim DI, Jung CS, Kim JY, Nam KJ, Choo KS, Jung YJ
- 4971** CD8-positive indolent T-Cell lymphoproliferative disorder of the gastrointestinal tract: A case report and review of literature
Weng CY, Ye C, Fan YH, Lv B, Zhang CL, Li M
- 4985** Bone flare after initiation of novel hormonal therapy in patients with metastatic hormone-sensitive prostate cancer: A case report
Li KH, Du YC, Yang DY, Yu XY, Zhang XP, Li YX, Qiao L
- 4991** Postoperative infection of the skull base surgical site due to suppurative parotitis: A case report
Zhao Y, Zhao Y, Zhang LQ, Feng GD
- 4998** Blunt aortic injury-traumatic aortic isthmus pseudoaneurysm with right iliac artery dissection aneurysm: A case report
Fang XX, Wu XH, Chen XF
- 5005** Extensive complex thoracoabdominal aortic aneurysm salvaged by surgical graft providing landing zone for endovascular graft: A case report
Jang AY, Oh PC, Kang JM, Park CH, Kang WC
- 5012** Gastric heterotopia of colon found cancer workup in liver abscess: A case report
Park JG, Suh JI, Kim YU
- 5018** Clinical manifestations and gene analysis of Hutchinson-Gilford progeria syndrome: A case report
Zhang SL, Lin SZ, Zhou YQ, Wang WQ, Li JY, Wang C, Pang QM
- 5025** Neurocutaneous melanosis with an intracranial cystic-solid meningeal melanoma in an adult: A case report and review of literature
Liu BC, Wang YB, Liu Z, Jiao Y, Zhang XF
- 5036** Metastasis of liver cancer to the thyroid after surgery: A case report
Zhong HC, Sun ZW, Cao GH, Zhao W, Ma K, Zhang BY, Feng YJ

- 5042** Spontaneous liver rupture following SARS-CoV-2 infection in late pregnancy: A case report
Ambrož R, Stašek M, Molnár J, Špička P, Klos D, Hambálek J, Skanderová D
- 5051** Carotid blowout syndrome caused by chronic infection: A case report
Xie TH, Zhao WJ, Li XL, Hou Y, Wang X, Zhang J, An XH, Liu LT
- 5057** Is repeat wide excision plus radiotherapy of localized rectal melanoma another choice before abdominoperineal resection? A case report
Chiu HT, Pu TW, Yen H, Liu T, Wen CC
- 5064** Metaplastic breast cancer with chondrosarcomatous differentiation combined with concurrent bilateral breast cancer: A case report
Yang SY, Li Y, Nie JY, Yang ST, Yang XJ, Wang MH, Zhang J
- 5072** Rare solitary splenic metastasis from a thymic carcinoma detected on fluorodeoxyglucose-positron emission tomography: A case report
Tsai YH, Lin KH, Huang TW
- 5077** Type A aortic dissection following heart transplantation: A case report
Zeng Z, Yang LJ, Zhang C, Xu F
- 5082** Catheter-related infections caused by *Mycobacterium abscessus* in a patient with motor neurone disease: A case report
Pan SF, Zhang YY, Wang XZ, Sun JJ, Song SL, Tang YR, Wang JL
- 5088** Clear aligner treatment for a four-year-old patient with anterior cross-bite and facial asymmetry: A case report
Zou YR, Gan ZQ, Zhao LX
- 5097** Knot impingement after arthroscopic rotator cuff repair mimicking infection: A case report
Kim DH, Jeon JH, Choi BC, Cho CH
- 5103** Solitary primary pulmonary synovial sarcoma: A case report
He WW, Huang ZX, Wang WJ, Li YL, Xia QY, Qiu YB, Shi Y, Sun HM
- 5111** Anesthetic management for intraoperative acute pulmonary embolism during inferior vena cava tumor thrombus surgery: A case report
Hsu PY, Wu EB
- 5119** Delayed diagnosis of arytenoid cartilage dislocation after tracheal intubation in the intensive care unit: A case report
Yan WQ, Li C, Chen Z

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Cases*, Jing Yang, MD, Associate Professor, Department of the First General Surgery, Gansu Provincial Hospital, Lanzhou 730000, Gansu Province, China. 21634604@qq.com

AIMS AND SCOPE

The primary aim of *World Journal of Clinical Cases* (WJCC, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

INDEXING/ABSTRACTING

The WJCC is now indexed in Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports/Science Edition, Scopus, PubMed, and PubMed Central. The 2021 Edition of Journal Citation Reports® cites the 2020 impact factor (IF) for WJCC as 1.337; IF without journal self cites: 1.301; 5-year IF: 1.742; Journal Citation Indicator: 0.33; Ranking: 119 among 169 journals in medicine, general and internal; and Quartile category: Q3. The WJCC's CiteScore for 2020 is 0.8 and Scopus CiteScore rank 2020: General Medicine is 493/793.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: Ying-Yi Yuan; Production Department Director: Xiang Li; Editorial Office Director: Jin-Lei Wang.

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

EDITORS-IN-CHIEF

Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

May 26, 2022

COPYRIGHT

© 2022 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Sudden deafness as a prodrome of cerebellar artery infarction: Three case reports

Bang-Liang Li, Jia-Yuan Xu, Sen Lin

Specialty type:

Otorhinolaryngology

Provenance and peer review:

Unsolicited article; Externally peer reviewed.

Peer-review model:

Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): 0
Grade C (Good): C, C, C
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Chu HT, Viet Nam;
Salim A, Pakistan; Ueda H, Japan

Received: September 24, 2021

Peer-review started: September 24,
2021

First decision: February 7, 2022

Revised: March 4, 2022

Accepted: April 3, 2022

Article in press: April 3, 2022

Published online: May 26, 2022



Bang-Liang Li, Jia-Yuan Xu, Sen Lin, Department of Ear, Nose, and Throat, The Third Affiliated Hospital of Wenzhou Medical University, Wenzhou 325000, Zhejiang Province, China

Corresponding author: Sen Lin, MD, Professor, Department of Ear, Nose, and Throat, The Third Affiliated Hospital of Wenzhou Medical University, No. 108 Wansong Road, Ruian, Wenzhou 325000, Zhejiang Province, China. lnns@163.com

Abstract

BACKGROUND

To summarize the clinical characteristics of acute cerebral infarction (ACI) in patients with sudden deafness (SD) as the first symptom, improve the awareness of the disease, and help diagnosis and treatment.

CASE SUMMARY

From 2019 to 2020, three patients with ACI with SD as the first symptom were admitted to our hospital. Pure tone audiometry, head magnetic resonance imaging (MRI), vertebral artery and carotid artery B-ultrasound, head and neck computed tomography angiography, and other examinations were performed. Following the treatment of SD, hearing and dizziness were not significantly improved. Then, the patients developed symptoms of related cranial nerve injury, and brain MRI showed cerebral infarction in the cerebellopontine angle area. All three cases were transferred to the neurology department for relevant conservative treatment.

CONCLUSION

Patients with ACI with SD as the first symptom usually attend the otolaryngology clinic. Here a diagnosis of SD, which is based on an audiological examination, is made and the corresponding treatment is administered. To reduce the misdiagnosis of this disease, close attention should be paid to the changes in the patient's clinical symptoms and related auxiliary examinations should be performed, such as brain MRI and cerebrovascular imaging. Otolaryngologists should pay attention to the type and severity of hearing loss, the accompanying symptoms, age, high-risk factors for cerebral infarction, and related cranial nerve symptoms in patients with SD. If the patient's early brain MRI does not show abnormalities, monitoring remains essential. The head MRI should be analyzed quickly based on the changes in the symptoms of the patient, to make an accurate diagnosis and provide the timely and correct treatment for the patients.

Key Words: Acute cerebral infarction; Anterior inferior cerebellar artery; Sudden deafness; Case report

©The Author(s) 2022. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: The cerebral infarction patients with sudden deafness as the first symptom are often easy to miss diagnosis. For this kind of patient, comprehensive combination of patient symptoms, hearing examination, imaging examination, can make the correct diagnosis as soon as possible to give timely treatment.

Citation: Li BL, Xu JY, Lin S. Sudden deafness as a prodrome of cerebellar artery infarction: Three case reports. *World J Clin Cases* 2022; 10(15): 4895-4903

URL: <https://www.wjgnet.com/2307-8960/full/v10/i15/4895.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v10.i15.4895>

INTRODUCTION

Sudden deafness (SD) is a common emergency in otolaryngology, refers to the sensorineural hearing loss that occurs suddenly within 72 h with unknown causes. At least in two adjacent frequencies, hearing loss ≥ 20 dB HL, most of them are unilateral sudden deafness, and very few involve both ears [1]. It has many causes, among which vascular disease is the main one [2,3]. Insufficient blood supply to the basilar artery or the anterior inferior cerebellar artery and the posterior inferior cerebellar artery might cause SD [4]. A small number of patients with cerebral infarction have SD as the first symptom or only show SD [5,6].

These patients often receive delayed treatment due to difficult diagnosis in the early stages of the disease. This paper will retrospectively analyze three cases of acute cerebral infarction (ACI) with SD as the first symptom. The clinical characteristics, audiological characteristics, and imaging characteristics of these patients are summarized. This information increases the knowledge of the disease and could help in the timely and correct diagnosis and treatment of the disease.

CASE PRESENTATION

Chief complaints

Case 1: Sudden hearing loss in the right ear for 2 d.

Case 2: Sudden hearing loss in the left ear for 2 d.

Case 3: Sudden hearing loss in the left ear for 1 d.

History of present illness

Case 1: A 53-year-old female was admitted to the otolaryngology department of our hospital complaining of hearing loss in the right ear for 2 d. The sudden hearing loss was accompanied by tinnitus and dizziness.

Case 2: A 58-year-old male was admitted to the otolaryngology department of our hospital complaining of hearing loss in the left ear for 2 d. The sudden hearing loss was accompanied by tinnitus, stuffy ear, and dizziness.

Case 3: A 71-year-old female was admitted to the department of otolaryngology of our hospital complaining of hearing loss in the left ear for 1 d. The sudden hearing loss was accompanied by left side headache and dizziness.

History of past illness

Case 1: The patient had suffered left a cerebral infarction 1 year previously and had 10 years of history of hypertension and diabetes.

Case 2: The patient had a 1-year history of hypertension.

Case 3: The patient had suffered a cerebral infarction 5 years ago. There was an 8-year history of hypertension and a 10-year history of diabetes.

Personal and family history

Cases 1-3: The personal and family history of all patients was unremarkable.

Physical examination

Case 1: The patient's blood pressure was 151/85 mmHg. Both external auditory canals were clear, and both eardrums were intact. Both eyes showed sustained horizontal nystagmus. The clinical neurological examination revealed clear consciousness and normal limb muscle strength.

Case 2: The patient's blood pressure was 166/99 mmHg. The clinical neurological examination revealed clear consciousness and normal limb muscle strength. Both external auditory canals were clear, and both eardrums were intact. Both eyes showed sustained horizontal nystagmus.

Case 3: The patient's blood pressure was 163/95 mmHg. The clinical neurological examination revealed clear consciousness and normal limb muscle strength. Bilateral ear canals were clear, bilateral tympanum was intact. Both eyes showed sustained horizontal nystagmus.

Laboratory examinations

Cases 1 and 3: The fasting blood glucose and blood lipid were elevated.

Case 2: The blood lipid was elevated.

Imaging examinations

Case 1: Pure tone audiometry showed right sensorineural hearing loss with an average threshold of 60 dB HL (Figure 1A).

On the day of admission, brain computed tomography (CT) showed a previous lacunar infarct in the left basal ganglia. Mastoid MRI revealed no obvious abnormalities in the bilateral internal auditory canal or mastoid process (Figure 1B and C).

After 8 d of hospitalization, reexamination of the brain MRI demonstrated an acute infarction in the right cerebellopontine angle (Figure 1D and E). Computed tomography angiography (CTA) of the brain and neck showed severe posterior cerebral artery stenosis and basilar stenosis (Figure 1F-I). Ultrasound of the carotid and vertebral artery revealed plaques in the carotid artery and lower blood flow velocity of the right vertebral artery.

Case 2: Pure tone audiometry showed left sensorineural hearing loss with an average threshold of 90 dB HL (Figure 2A).

After 5 d of hospitalization, the brain MRI demonstrated an acute infarction in the left cerebellopontine angle (Figure 2B-E). CTA of the brain and neck showed left vertebral artery segmental stenosis (Figure 2F-I). Ultrasound of the carotid and vertebral artery revealed plaques in the carotid artery and lower blood flow velocity of the left vertebral artery.

Case 3: Pure tone audiometry showed left sensorineural hearing loss with an average threshold of 90 dB HL (Figure 3A).

On the day of admission, brain CT showed a previous lacunar infarction in the pons and right basal ganglia.

After 1 d of hospitalization, brain MRI demonstrated an acute infarction in the left cerebellopontine angle (Figure 3B-E). CTA of the brain and neck showed left vertebral artery segmental stenosis (Figure 3F-I). Ultrasound of the carotid and vertebral artery revealed plaques in the carotid artery and lower blood flow velocity of the right vertebral artery.

FINAL DIAGNOSIS

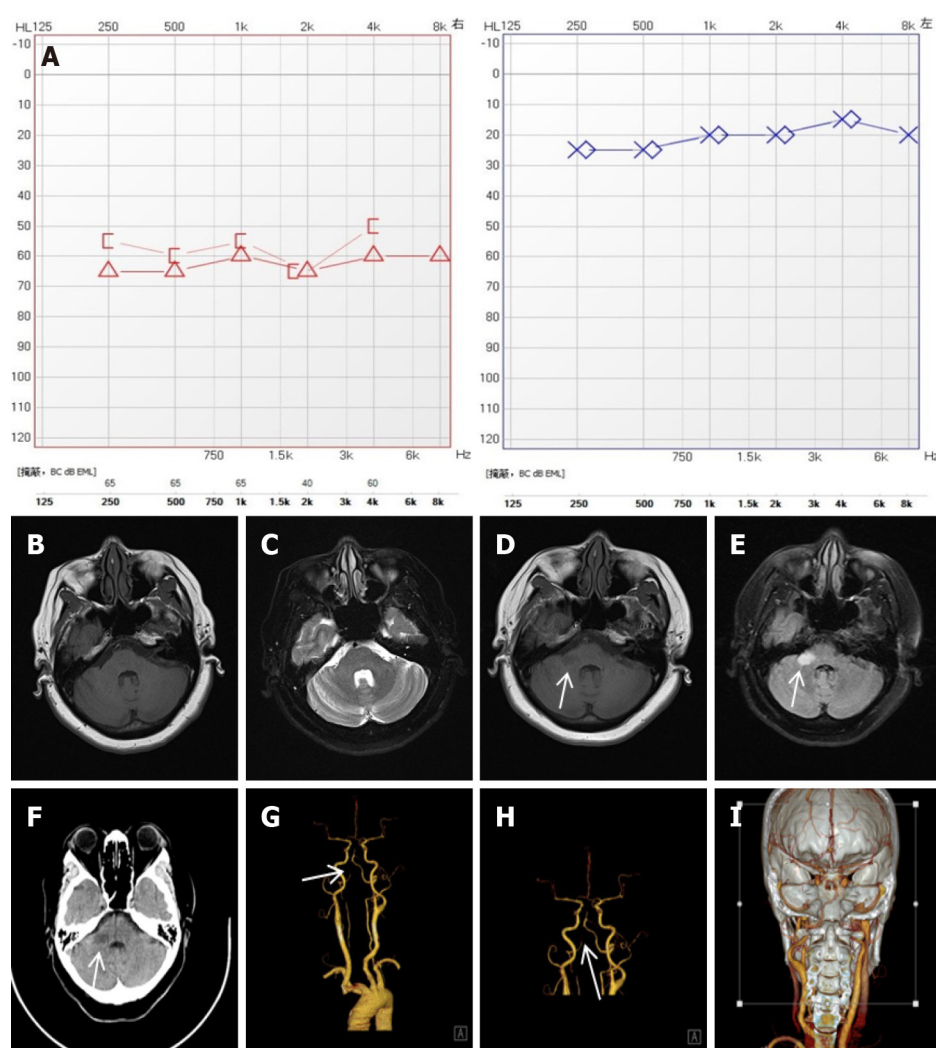
Case 1: The patient was diagnosed with right cerebellar infarction.

Cases 2 and 3: The patient was diagnosed with left cerebellar infarction.

TREATMENT

Case 1

The patient was diagnosed with right ear SD and commenced an 80 mg methylprednisolone intravenous drip, nutritional nerve treatment, and improved blood circulation treatment. The hearing loss and dizziness did not improve during treatment. On day 8 after admission to the department, the patient experienced lips numbness and displayed dysarthria. Both eyes showed sustained vertical nystagmus. After imaging examination, the patient was diagnosed with right cerebellar infarction and



DOI: 10.12998/wjcc.v10.i15.4895 Copyright ©The Author(s) 2022.

Figure 1 Related auxiliary examination of case one. A: Pure tone auditory threshold, moderate to severe sensorineural hearing loss in the right ear; B, C: Mastoid magnetic resonance imaging (MRI)(2019-11-12), no obvious abnormalities were found in bilateral internal auditory canal and mastoid process, see pontine lacunar infarction; D, E: Brain MRI (2019-11-19), patchy long T1 and long T2 signal foci were seen in the right cerebellar foot, and diffusion-weighted imaging showed high signal intensity; F-I: Brain and neck computed tomography angiography, patchy low-density shadow was seen in the right cerebellar foot, local lumen stenosis of the right posterior cerebral artery and basilar artery was not clear.

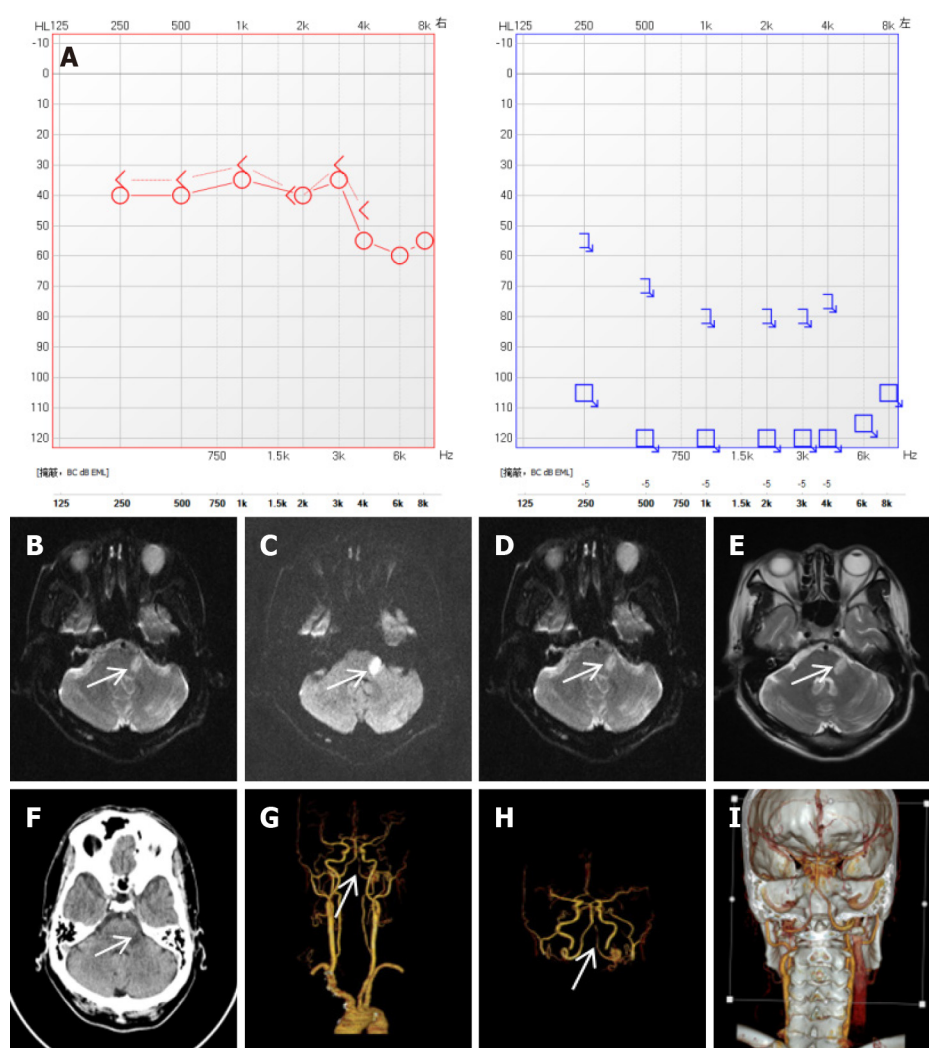
transferred to the department of neurology. Treatment in neurology department: The patient was treated with aspirin tablets and Plavix to inhibit platelet aggregation, a statin to enhance plaque stabilization, urinary kallikrein to improve collateral blood circulation, and Voluven to expand capacity. Blood pressure levels were managed within the normal range.

Case 2

The patient was diagnosed with left ear SD and started on 80 mg methylprednisolone intravenous drip, nutritional nerve treatment, and improved blood circulation treatment. The hearing loss and dizziness did not improve during treatment. On day 5 after hospital admission, the patient developed instability when walking. Both eyes showed sustained vertical nystagmus. Neurological examination showed decreased muscle strength on the left side, positive finger and nose test and positive calcaneus and shin test. After imaging examination, the patient was diagnosed with left cerebellar infarction and transferred to the department of neurology. Treatment in neurology department: The patient was treated with aspirin tablets and Plavix to inhibit platelet aggregation, amlodipine besylate and atorvastatin calcium to lower blood pressure and regulate lipid levels, beraprost sodium to improve circulation, compound troxerutin and poreine cerebroside to nourish nerves.

Case 3

The patient was diagnosed with left ear SD and started on 40mg methylprednisolone intravenous drip, nutritional nerve treatment, and improved blood circulation treatment. On day 1 after hospital admission, the patient developed facial paralysis and swallowing disturbance. Both eyes showed



DOI: 10.12998/wjcc.v10.i15.4895 Copyright ©The Author(s) 2022.

Figure 2 Related auxiliary examination of case two. A: Pure tone auditory threshold, extremely severe sensorineural deafness in the left ear; B–E: Brain magnetic resonance imaging, ovoid slightly longer T1 slightly longer T2 signal lesion was observed in the left cerebellar foot, and diffusion-weighted imaging presented high signal; F–I: Brain and neck computed tomography angiography, patchy, slightly low-density lesions were seen in the left pontine angle, with intracranial segmental stenosis of the left vertebral artery.

sustained vertical nystagmus. Neurological examination showed the degree of facial paralysis was house-Brackmann grade III that the left nasolabial fold was shallow and the Angle of the mouth was skewed to the right. The finger nose test was positive and the calcaneus tibial test was positive. After imaging examination, the patient was diagnosed with left cerebellar infarction and transferred to the department of neurology. Treatment in neurology department: The patient was treated with aspirin and Plavix to inhibit platelet aggregation, atorvastatin to regulate lipids and Ginkgo-Damole to improve circulation.

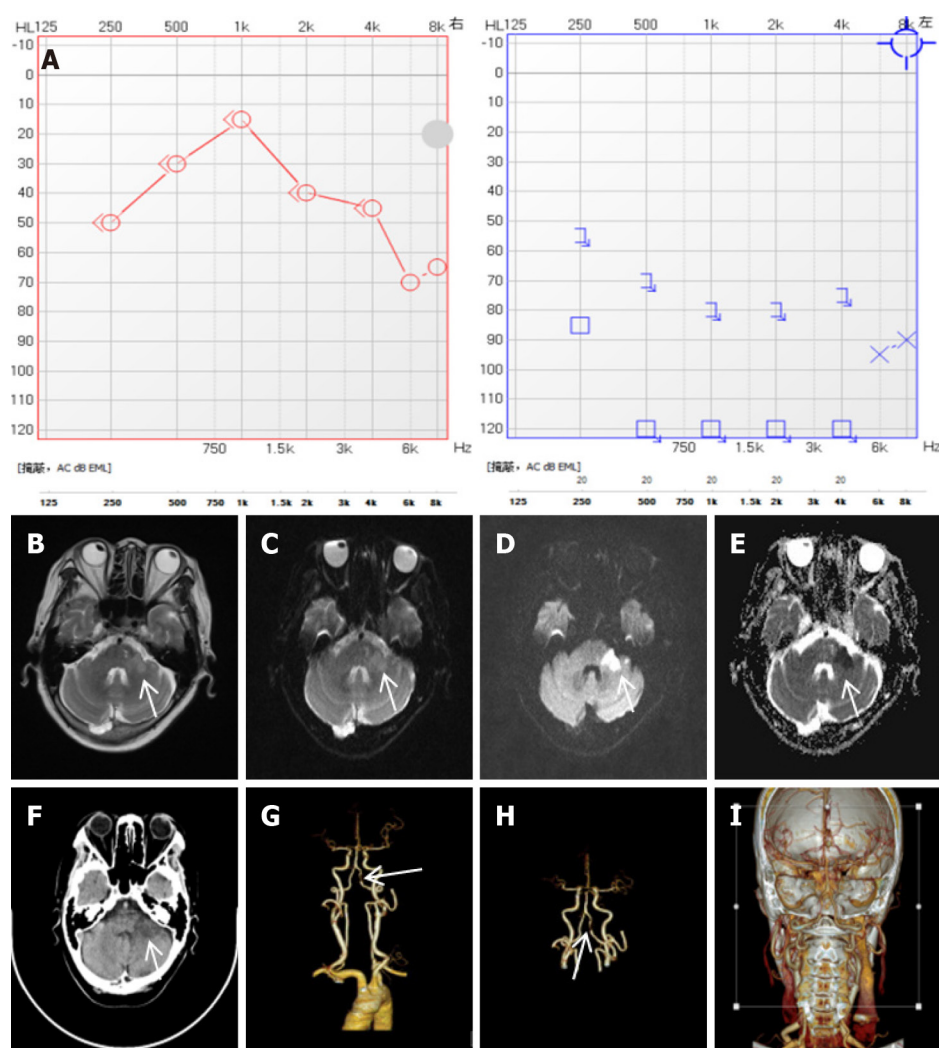
OUTCOME AND FOLLOW-UP

Case 1

The patient showed persistent right hearing loss, lower degree of dizziness, and dysmetria on finger-to-nose and heel-to-shin testing.

Case 2

Blood pressure levels were managed within the normal range. The patient showed persistent left hearing loss and tinnitus, lower degrees of dizziness, and dysmetria on finger-to-nose and heel-to-shin testing.



DOI: 10.12998/wjcc.v10.i15.4895 Copyright ©The Author(s) 2022.

Figure 3 Related auxiliary examination of case three. A: Pure tone auditory threshold, extremely severe sensorineural deafness in the left ear; B–E: Brain magnetic resonance imaging, patchy and spotted long T1 and long T2 signal shadows were seen in the left midcerebellar foot, and the diffuse image of lesions in the left midcerebellar foot was all high signal; F–I: Brain and neck computed tomography angiography, patchy low-density shadow was seen in the left cerebellum, with slightly blurred edges and a range of about 2.2 cm × 1.6 cm. The initial segment of the left vertebral artery was tortuous and the left vertebral artery V4 segment was moderately and severely narrowed.

Case 3

The levels of blood pressure and blood glucose were managed within the normal range. The patient showed persistent left hearing loss and facial paralysis and lower degrees of dizziness.

DISCUSSION

The characteristics of the patients are shown in Table 1. According to the frequency and degree of hearing loss, SD can be divided into high frequency descending type, low frequency descending type, flat descending type and total deafness type. Different types of SD often indicate different pathogenesis. The low frequency descending type is mostly membranous labyrinthian hydrops. The high frequency descending type is mostly hair cell injury. Most of the flat descending types were vasospasm or stria dysfunction. Embolism or thrombosis of the inner ear is the most common type of total deafness type. The frequency of hearing loss is related to the different parts of the blood supply of the inner ear. The high frequency sounds are detected at the bottom of the cochlea, while the low frequency sounds are detected at the top of the cochlea. The flat descending type and the total deafness type suggest that there is ischemia in the whole inner ear, but the degree is different. For audiological manifestations, hearing loss can occur before other pontine infarction symptoms[7]. All three cases presented hearing loss across all frequencies (250–8000 Hz), which might indicated that blood supply to all cochlear turns is affected. Two out of three cases showed profound hearing loss (> 90 dB HL), which might suggested severe ischemia. The onset of infarction was relatively late in the case with moderately severe hearing loss(60

Table 1 The characteristics of the patients

Basic information	ID	1	2	3
	Gender	Female	Male	Female
	Age (yr)	53	58	71
Previous history	Hypertension	Y	Y	Y
	DM	Y	N	Y
	Cerebral infarction	Y	N	Y
Hearing loss	Day	2	2	1
	Which ear	Right	Left	Left
	Degree (dB HL)	60	> 90	> 90
	Frequency	250–8000	250–8000	250–8000
Accompanying symptoms	Dizziness	Y	Y	Y
	Tinnitus	Y	Y	Y
	Onset after hearing loss (d)	10	7	1

dB HL) compared with the other two cases, which might indicate that the development of infarcts was related to the severity of cochlear ischemia and the degree of hearing loss.

From the perspective of concomitant symptoms, all three cases were accompanied by dizziness symptoms of varying degrees. Different from viral infection, IAA ischemia rarely results in simple hearing loss or vestibular function impairment, but often results in both. For patients with sudden deafness as the first symptom of cerebral infarction, the nature of dizziness is often difficult to distinguish. Such patients have both brain center injury and peripheral auditory and vestibular system injury, so it is impossible to determine whether dizziness is central or peripheral at the first time. The dizziness symptoms of case 1 and case 2 were not significantly improved after treatment for at least one week in the otolaryngology department. Generally speaking, peripheral dizziness will be improved to varying degrees after treatment. For the phenomenon of dizziness lasting for a long time and poor symptom improvement in the two cases, the possibility of central dizziness should be considered, which often indicates the possibility of central lesions. The nystagmus of the three patients ranged from horizontal nystagmus at admission to vertical nystagmus, which also supports the possibility of a central lesion.

It has been established that the major risk factors for cerebral infarction include hypertension, diabetes mellitus (DM), tobacco smoking, high cholesterol, obesity, cardiovascular disease, and a history of stroke. In this study, all three cases had hypertension, two had DM, and two had a history of stroke. It can be concluded that hypertension, diabetes and history of cerebral infarction are risk factors for sudden deafness patients, and such previous history increases the incidence of cerebral infarction in patients with sudden deafness. These risk factors must be considered during the evaluation of SD.

The artery supplying the inner ear comes from the internal auditory artery (IAA), and IAA is the only artery supplying the inner ear. IAA originated from the vertebral-basilar artery system. Most of them originated in the anterior inferior cerebellar artery (AICA), accounting for 80%, and a few originated in the posterior inferior cerebellar artery (PICA) or the basilar artery. The IAA is the terminal branch, lacking collateral circulation and slender[8], and the inner ear has a high energy demand[9]. Due to the frequent anatomical variations in the vertebral-basilar-internal auditory artery system, the vulnerability of the blood supply system of the inner ear is aggravated. The cerebellum is mainly supplied by PICA, AICA and superior cerebellar artery (SCA). The labyrinthine (internal auditory) artery is a branch of the AICA. Cerebral infarction of AICA could be confirmed with infarction of brain MRI that shows infarction in the lateral lower side of the pons and the middle cerebellum[10]. MRI images showed that the three patients had infarction sites in the cerebellar foot, which suggested AICA cerebral infarction.

AICA arises from the basilar artery. CTA images of all three patients showed vertebrobasilar artery stenosis. This is consistent with a former study on AICA infarction that compared the MRI angiography of patients with or without auditory vestibular dysfunctions[11]. They found that infarct patients with basilar artery stenosis near the AICA opening were more probable to have auditory and vestibular dysfunctions. Because of the high demand for blood supply, the inner ear is sensitive to insufficiency of blood flow. Therefore, basilar artery stenosis could be a risk factor for sudden hearing loss and cerebral infarcts. In case 1, MRI of the mastoid process was completed after admission. The first MRI indicated only lacunar infarction in the pons, and no acute infarction was found. CTA indicated basilar artery stenosis in the patient. Therefore, for patients with sudden deafness, special attention should be paid to the stenosis of basilar artery. If basilar artery stenosis exists, the occurrence of cerebral infarction still

needs to be alert even when infarction are cannot found by brain MRI[12]. It is very necessary to review magnetic resonance in time for such patients.

CT imaging is not sensitive to cerebral infarction, especially in the acute phase (within 24 h).

CT images that show fuzzy sign of the bean nucleus and brain tissue swelling sign could be an indicator. Overall, 24 h after cerebral infarction, CT will show low-density, mainly because the density of brain grey matter has been slightly reduced. This was different from brain tissue on the image, which could help to diagnose cerebral infarction. Approximately 3 d after cerebral infarction, the CT showed signs of low-density. The possibility of cerebral infarction cannot be ruled out by the CT images. The main factors that affect the prognosis of patients with SD include age, degree of hearing loss, the timing of treatment, accompanying symptoms, and previous medical history. After treatment, the hearing condition of the three patients did not improve significantly. The patient's medical history and general condition indicated the risk of cerebral infarction and the prognosis.

CONCLUSION

ACI with SD as the first symptom is relatively rare, but otolaryngologists should be aware of this possibility. During the evaluation of patients with sudden hearing loss, brain CT, MRI, and vascular assessment might be necessary for differential diagnosis. Patients that present sudden hearing loss and have risk factors for infarcts should be closely monitored. In combination, the degree and frequency of hearing loss, accompanying symptoms, previous history, and neurologic assessment should all be taken into consideration for the diagnosis of sudden hearing loss.

FOOTNOTES

Author contributions: Lin S designed most of the investigation; Li BL performed most of the investigation and wrote the manuscript; Xu JY and Lin S performed the data analysis and contributed to data interpretation; and All authors read and approved the manuscript.

Informed consent statement: Written informed consent was obtained from individual participants.

Conflict-of-interest statement: All authors declare that there are no conflicts of interest.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Country/Territory of origin: China

ORCID number: Bang-Liang Li 0000-0001-6191-2802; Jia-Yuan Xu 0000-0001-5954-7084; Sen Lin 0000-0002-1175-0232.

S-Editor: Ma YJ

L-Editor: A

P-Editor: Ma YJ

REFERENCES

- 1 **Editorial Board of Chinese Journal of Otolaryngology head and Neck Surgery**, Otolaryngology Head and Neck Surgery Branch; Chinese Medical Association. Guidelines for diagnosis and Treatment of sudden deafness (2015). *Zhonghua Erbihou Toujing Waike Zazhi* 2015; **50**: 443-447 [DOI: [10.3760/cma.j.issn.1673-0860.2015.06.002](https://doi.org/10.3760/cma.j.issn.1673-0860.2015.06.002)]
- 2 **Wu CC**, Young YH. Vestibular evoked myogenic potentials are intact after sudden deafness. *Ear Hear* 2002; **23**: 235-238 [PMID: [12072615](https://pubmed.ncbi.nlm.nih.gov/12072615/) DOI: [10.1097/00003446-200206000-00007](https://doi.org/10.1097/00003446-200206000-00007)]
- 3 **Rosenhall U**, Sundh V. Age-related hearing loss and blood pressure. *Noise Health* 2006; **8**: 88-94 [PMID: [17687184](https://pubmed.ncbi.nlm.nih.gov/17687184/) DOI: [10.4103/1463-1741.33539](https://doi.org/10.4103/1463-1741.33539)]
- 4 **Stachler RJ**, Chandrasekhar SS, Archer SM, Rosenfeld RM, Schwartz SR, Barrs DM, Brown SR, Fife TD, Ford P, Ganiats TG, Hollingsworth DB, Lewandowski CA, Montano JJ, Saunders JE, Tucci DL, Valente M, Warren BE, Yaremchuk KL, Robertson PJ; American Academy of Otolaryngology-Head and Neck Surgery. Clinical practice guideline: sudden hearing loss. *Otolaryngol Head Neck Surg* 2012; **146**: S1-35 [PMID: [22383545](https://pubmed.ncbi.nlm.nih.gov/22383545/) DOI: [10.1177/0194599812436449](https://doi.org/10.1177/0194599812436449)]

- 5 **Lee H**, Kim HJ, Koo JW, Kim JS. Progression of acute cochleovestibulopathy into anterior inferior cerebellar artery infarction. *J Neurol Sci* 2009; **278**: 119-122 [PMID: [19108852](#) DOI: [10.1016/j.jns.2008.11.019](#)]
- 6 **Kim HA**, Yi HA, Lee H. Recent Advances in Cerebellar Ischemic Stroke Syndromes Causing Vertigo and Hearing Loss. *Cerebellum* 2016; **15**: 781-788 [PMID: [26573627](#) DOI: [10.1007/s12311-015-0745-x](#)]
- 7 **Lee H**. Audiovestibular loss in anterior inferior cerebellar artery territory infarction: a window to early detection? *J Neurol Sci* 2012; **313**: 153-159 [PMID: [21996273](#) DOI: [10.1016/j.jns.2011.08.039](#)]
- 8 **Li Y**, Yang J, Liu J, Wu H. Restudy of malformations of the internal auditory meatus, cochlear nerve canal and cochlear nerve. *Eur Arch Otorhinolaryngol* 2015; **272**: 1587-1596 [PMID: [24599597](#) DOI: [10.1007/s00405-014-2951-4](#)]
- 9 **Kim JS**, Lopez I, DiPatre PL, Liu F, Ishiyama A, Baloh RW. Internal auditory artery infarction: clinicopathologic correlation. *Neurology* 1999; **52**: 40-44 [PMID: [9921846](#) DOI: [10.1212/wnl.52.1.40](#)]
- 10 **Li T**, Qiu ZH, Liu XY, Du YYL, Xie LF, Sun SH, Yu XN, Pan T. A case report of acute cerebral infarction with unilateral sudden deafness as the first symptom. *Zhongguo Tingli Yuyan Kangfu Kexue Zazhi* 2020; **18**: 35-36 [DOI: [10.3969/j.issn.1672-4933.2020.01.009](#)]
- 11 **Lee H**, Kim JS, Chung EJ, Yi HA, Chung IS, Lee SR, Shin JY. Infarction in the territory of anterior inferior cerebellar artery: spectrum of audiovestibular loss. *Stroke* 2009; **40**: 3745-3751 [PMID: [19797177](#) DOI: [10.1161/STROKEAHA.109.564682](#)]
- 12 **Zamysłowska-Szmytko E**, Szostek-Rogula S, Śliwińska-Kowalska M. Bedside examination for vestibular screening in occupational medicine. *Int J Occup Med Environ Health* 2015; **28**: 379-387 [PMID: [26182932](#) DOI: [10.13075/ijom.1896.00514](#)]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: bpgoffice@wjgnet.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

