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CASE REPORT

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Cortical deafness as a sequel of recurrent stroke in patient with prosthetic heart valves and atrial fibrillation: a case report

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Abstract

Background Cortical deafness is an unusual occurrence caused by injury to the central auditory pathway but not to the hearing organ. This paper reports the first case of cortical deafness as a sequel of recurrent stroke in a patient with prosthetic heart valves and atrial fibrillation in Asia.

Case presentation A 40-year-old man with a history of atrial fibrillation and valvular heart disease comes with weakness on the right side of the body and slurred speech. Examination showed hemiplegia with increased d-dimer and activated partial thromboplastin time. (APTT). Brain MRI showed multiple subacute infarctions in the temporal lobe. Diffusion Tensor Imaging (DTI) tractography showed no visible auditory tract. Pure tone audiogram and brainstem auditory evoked potential test was normal, but speech reception threshold test was very poor. The patient has been diagnosed with recurrent ischemic stroke with sequel cortical deafness and received anticoagulant therapy and speech therapy. The patient reported minimal subjective impairment 1 month later with no further neurological deterioration.

Conclusions A multidisciplinary clinical approach is needed in patients with cortical deafness, especially distinguishing it from other central hearing losses.

Keywords Cortical deafness, Stroke, Atrial fibrillation, Heart valve, Case report

Background

Cardioembolic stroke has the highest mortality rate of all stroke subtypes and is particularly prone to recur [1, 2]. Atrial fibrillation is the primary risk factor for recurrence, which the existence of cardiac valve abnormalities may increase [1]. Recurrence of a cardioembolic stroke may result in various complications, including cortical deafness. Cortical deafness is an unusual occurrence caused by injury to the central auditory pathway but not to the hearing organ [3]. Cortical deafness is a rare manifestation and has only been reported in cases of bitemporal lobe stroke [3]. It is difficult to diagnose due to the unusual and comparable clinical manifestations of other cognitive deficits, such as pure word deafness, auditory agnosia, and Wernicke Aphasia [3]. We present the first

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case of cortical deafness in a patient with mechanical heart valves and atrial fibrillation who had a recurrent stroke in Asia.

Case presentation

A 40-year-old man came to the ED with complaints of weakness on the right side of the body and slurred speech 4 h before admission. The patient had a history of atrial fibrillation and mechanical prosthetic valve placement on the aortic and mitral valves that were well-attached. The patient had a history of an ischemic stroke 3 years previously. Family history of stroke or heart disease was denied. History of smoking and alcohol consumption was denied. Physical examination revealed right gaze palsy, right facial upper motor neuron lesion, and right hemiplegia. The National Institutes of Health Stroke Scale (NIHSS) assessment was 21, and a modified Rankin scale (mRS) was 4.

Laboratory examinations showed increased d-dimer and prolonged activated partial thromboplastin time (APTT). Non-contrast head CT scan (Optima, GE, China) showed proximal left middle cerebral artery hyperdensity, chronic bilateral temporal lobe hypodensity, and right basal ganglia lacunar infarction. Brain MRI (Magnetom Essenza, Siemens, Germany) (Fig. 1) showed multiple subacute infarctions in the left anterior and posterior temporal lobe (red arrow), multiple chronic infarction in the right anterior temporal lobe (white arrow), and focal brain atrophy of the right temporal lobe (white arrow). DTI tractography (Magnetom Essenza, Siemens, Germany) showed no visible tract from bilateral auditory thalamus towards auditory cortices (green arrow) (Fig. 1).

Chest radiography (Moonray, Sago Medica, Italy) showed cardiomegaly with pulmonary engorgement and the presence of two prosthetic valves at the level of the 7–9 thoracic vertebrae. Electrocardiogram (Electrocardiograph 1 Channel, Endo, Indonesia) examination showed atrial fibrillation with a normal ventricular response. Transoesophageal echocardiography (Vivid E95 4D Echocardiography, GE, China), examination using contrast in the left atrium showed left atrial appendage enlargement, dilatation of all chambers, segmental hypokinesia, and an ejection fraction of 40.1%. High cortical function examinations showed patient's speech comprehension, speech repetition, and non-linguistic auditory comprehension were impaired. The pure tone audiogram was not disturbed, but the patient had a very poor speech reception threshold. Brainstem auditory evoked potential test (Integrity, Vivosonic, Canada) showed a normal peripheral auditory pathway. The patient has been diagnosed with recurrent stroke with sequel cortical deficiency.

Thrombolysis was not performed because of gastrointestinal bleeding, while thrombectomy could not be performed because of the cultural challenge. Anticoagulation is then considered. Stroke risk stratification and bleeding risk were calculated by CHA2DS2–VASc (score 3) and HAS–BLED (score 3). Patients were given heparin anticoagulation starting at 5000 units per 24 h after treatment of upper gastrointestinal bleeding, titrated up with a target APTT of 2.5 times. Bisoprolol 1×2.5 mg were also given as secondary stroke prevention medications.

During treatment, the patient showed clinical improvement. On the fifth day of onset, the patient appeared to respond to the examiner's speech. The comprehension improved, but fluency, naming, and repetition was still impaired. The weakness of the right side of the body also seems to have improved. On the eighth day, the patient began to follow simple commands and say a couple of words. Patient communication on the 12th day was gradually recovered.

The patient was discharged with NIHSS was 12, mRS was 4, International Normalized Ratio was 1.09, and was given warfarin 1×2 mg. One month after discharge, the patient reported minimal subjective impairment and no further neurological deterioration. Patients are satisfied with the treatment he has received. To support the healing process, the patient is no longer working as a nurse but as a medical record administrator instead.

Cortical deafness as a sequel of recurrent stroke, particularly in individuals with artificial heart valves and atrial fibrillation, is unusual and requires a thorough diagnosis.

On examination, the patient showed cortical deafness manifestation. Cortical deafness is defined as a selective decrease in recognising speech. Clinically, cortical deafness is often misdiagnosed as impaired cognitive function or aphasia. Cortical deafness can be distinguished from cognitive dysfunction by good written communication. Reading and writing are still possible for cortical deafness, but not for Wernicke's aphasia. Repetition is not possible in cortical deafness but is still possible in transcortical sensory aphasia. Impaired communication, pronunciation of words that are often incomprehensible, and undisturbed writing skills follow cortical deafness. These differences can be seen in Table 1.

Cortical deafness generally occurs as a result of bilateral superior temporal lobe lesions, as well as unilateral lesions in the primary auditory cortex [3]. The patient had a DTI examination that showed the auditory pathways' disruption from the thalamus to the auditory cortex bilaterally. The bilateral superior temporal lobe lesion occurred as a sequel to recurrent stroke and chronic infarction.

The limitation of this case is the inability to perform thrombectomy due to cultural barriers. Although anticoagulation has been carefully considered, thrombectomy

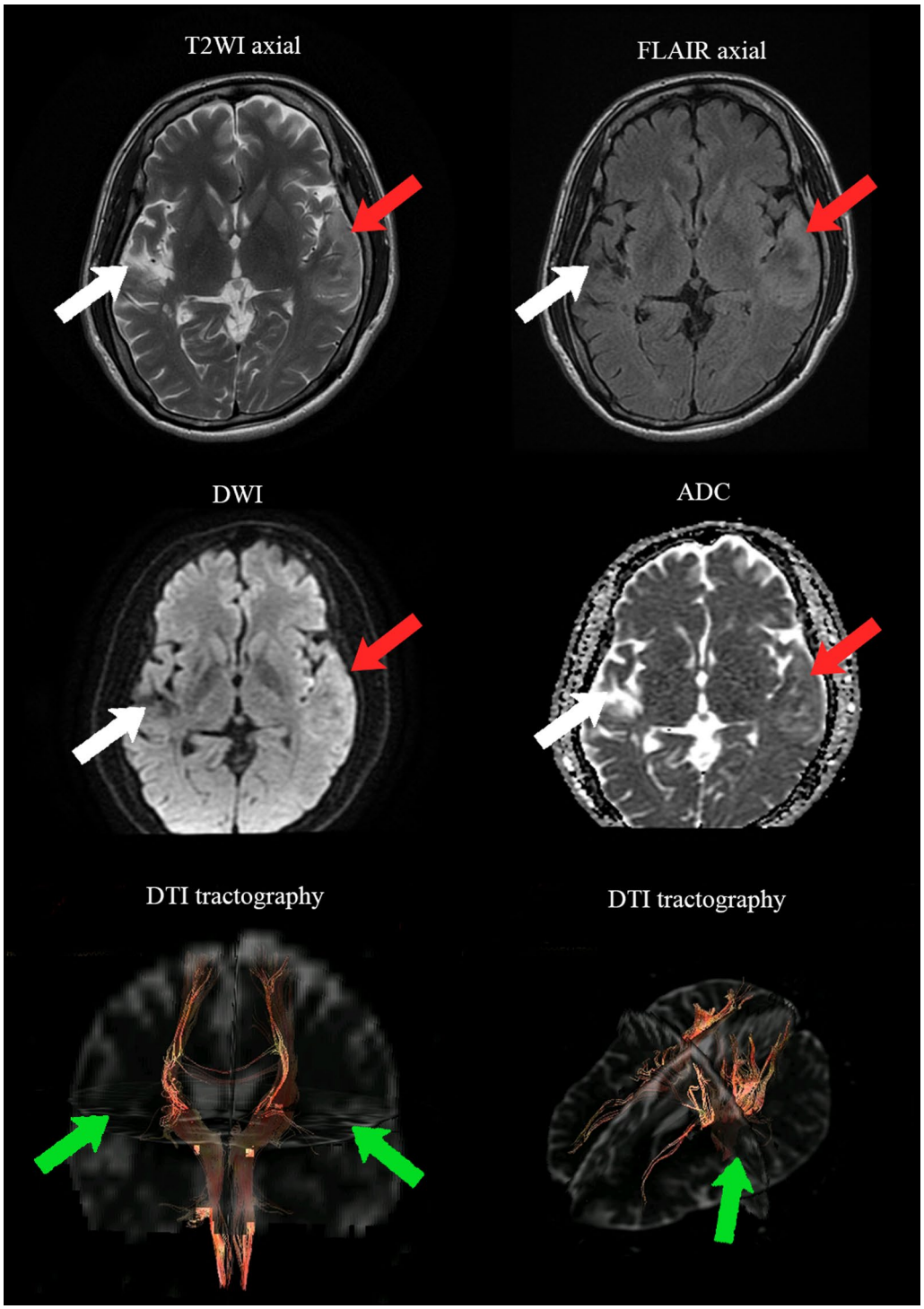

Fig. 1 Brain imaging of cortical deafness in recurrent stroke. Brain MRI showed multiple subacute infarctions in the left anterior and posterior temporal lobe (red arrow), multiple chronic infarctions in the right anterior temporal lobe (white arrow), and focal brain atrophy of the right temporal lobe (white arrow). DTI tractography showed no visible tract from bilateral auditory thalamus towards auditory cortices (green arrow). T2WI, T2 weighted image; FLAIR, Fluid Attenuated Inversion Recovery; DWI, Diffusion-Weighted Imaging; ADC, Apparent Diffusion Coefficient; DTI, Diffusion Tensor Imaging

Table 1 Differential diagnosis of cortical deafness

	Cortical deafness	Pure word deafness	Auditory agnosia	Cognitive–linguistic impairment	Wernicke aphasia	Transcortical sensory aphasia
Spontaneous speech	+	+	+	−	+	+
Speech comprehension	−	−	−	−	−	−
Speech repetition	−	−	−	−	−	+
Non-linguistic auditory comprehension	−	+	−	−	+	+
Reading comprehension	+	+	+	+	−	−
Written language	+	+	+	−	+	+
Naming	+	+	+	+	+	+
Hearing sensitivity	+	−	−	+	+	+

should also be considered, especially considering that thrombolysis is not performed because of gastrointestinal bleeding.

Conclusion

Cortical deafness, which is sometimes difficult to distinguish from other central hearing losses, can be a sequel to stroke in patients with prosthetic heart valves and atrial fibrillation. A holistic and multidisciplinary clinical approach is needed for these patients.

Abbreviations

ADC	Apparent diffusion coefficient
APTT	Activated partial thromboplastin time
CT	Computed tomography
DTI	Diffusion tensor imaging
DWI	Diffusion-weighted imaging
ED	Emergency department
FLAIR	Fluid-attenuated inversion recovery
HAS–BLED	Hypertension, abnormal renal/liver function, stroke, bleeding history or predisposition, labile INR, elderly, drugs/alcohol concomitantly
MRI	Magnetic resonance
NIHSS	National Institutes of Health Stroke Scale
mRS	Modified Rankin scale
TOAST	Trial of ORG 10,172 in acute stroke treatment
WI	Weighted image

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Author contributions

Conceptualization, AR, TM, MK, RH, PP, APP, AFJ, and AR; methodology, all authors; software, EW; validation, AR, TM, MK, and RH; formal analysis, AR, AFJ; investigation, AR, AFJ; resources, AR, TM, MK, RH; data curation, AR, EW; writing—original draft preparation, AR, EW; writing—review and editing, all authors; visualization, EW; supervision, AR, TM, MK, PP project administration, EW; funding acquisition, AR. All authors have read and agreed to the published version of the manuscript.

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Availability of data and materials

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Declarations

Ethics approval and consent to participate

The patient has given consent for publication. The Ethics Committee of the Faculty of Medicine, the Universitas Indonesia, approved the report protocols, with protocol number 917/UN2.F1/ETIK/PPM.00.02/2021 in May 2021.

Consent for publication

Written informed consent for publication was obtained from subject involved in the study.

Competing interests

The authors declare no conflict of interest.

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