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Low dose gabapentin abolishes ipsilateral tinnitus after peripheral facial palsy: A case report and literature review

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Abstract

A unilateral tinnitus occurred at right ear in a hypertensive and diabetic woman shortly after an ipsilateral peripheral facial palsy. Audiometric tests showed a predominant sensorineural hearing impairment at right ear. Her tinnitus was abolished after an administration of a low dose of gabapentin. In view of a controversy of gabapentin and tinnitus in previous trials, the findings in this patient support that low dose gabapentin can benefit specifically the subgroup of tinnitus patient with sensorineural impairment due to secondary contributing factor.

INTRODUCTION

Tinnitus is a common clinical disorder involving the audiovestibular pathway.[1] It is a frequent complication of a variety of neurological injuries such as traumatic brain damage, stroke, vestibulocochlear neuropathy, or intracranial hypotension/hypertension. Unfortunately, tinnitus occurring after neurological injury is always refractory to conventional treatments, including antidepressants[2] or anticonvulsants.[3] A literature review of the various treatments in tinnitus published in the Cochrane Database System suggests an equivocal benefit by repetitive transcranial magnetic stimulation[4], tinnitus retraining therapy[5], or cognitive behavioral therapy[6] based on limited data; whereas no significant effect by masking sound therapy[7], Ginkgo biloba[8], or hyperbaric oxygen therapy.[9] The effect of acupuncture is still unknown. This is the report of a woman whose unilateral tinnitus after ipsilateral peripheral facial palsy responded favorably to gabapentin.

CASE REPORT

A 69-year-old woman had hypertension and diabetes mellitus for 5 years. At 6 months ago, she found painful vesicles at lips on one morning, followed by sudden onset of right facial weakness on the next day. There was no alteration in taste, hearing, lacrimation, and salivation. Blink reflex and facial nerve electrophysiological studies supported an abnormality of the peripheral facial nerve at intratemporal portion. The patient was diagnosed to have facial nerve palsy of peripheral type. Although her facial weakness progressively improved after that, she noticed tinnitus confined to her right ear 3 months after the index facial palsy event. The sound was described as similar to metal scraped by sharp knife forward and backward; was high-pitched, nonpulsatile, intermittent, occurred spontaneously, and was slightly louder in a quiet environment. Her tinnitus did not change with alteration of head or body posture, discontinuation of drugs prescribed (amlodipine, metformin, glimepiride), covering of her ears, jaw opening and clenching, sleep deprivation, or with increased background environmental sound.

She consulted an otologist, who did not find any abnormality of her ears, eardrum, nose or throat. Pure tone audiogram showed a mixed sensorineural and conduction hearing impairment with a predominant sensorineural hearing loss at right side (Figure 1). Tympanogram did not reveal significant abnormality. Amitriptyline, alprazolam, lamotrigine and sodium valproate were given. They made her drowsy without relieving the tinnitus. On presentation, her vital signs were stable. Physical examination did not reveal any vesicles inside her right ear canal and neurological examination disclosed only a residual Grade III (House-Brackmann Grading System)

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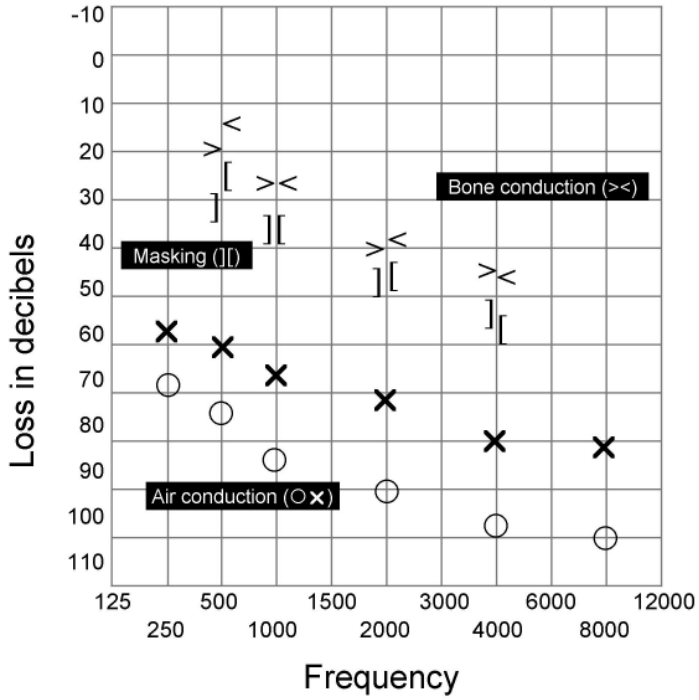

Figure 1. The audiometric test showed a mixed sensorineural and conduction hearing loss at both ears, with a predominant sensorineural hearing loss at the right side. (air conduction: ○ right ear and X left ear; bone conduction: > right ear and < left ear; masking:] right ear and [left ear).

right peripheral facial weakness. Bulbar function was normal. Cranial computerized tomography was also normal. Further investigations including biochemistry, hematology, lipid profile, autoimmune indices, antiphospholipid antibody and urinalysis did not show any abnormality, except an increase of blood anti-*Varicella Zoster Virus* IgG-antibody to 820 mIU/ml (reference range: < 150 mIU/ml). The blood anti-*Varicella Zoster Virus* IgM-antibody was 0.1 index (reference range: < 1.0 index). After informed consent, gabapentin 100 mg/day was prescribed. She reported that her tinnitus decreased by 30% at 2 weeks, and 90% by 8 weeks. Tinnitus recurred within 2 days after a discontinuation of gabapentin. It was ameliorated again after reintroduction of the drug. On maintenance of gabapentin 100 mg/day, her tinnitus did not recur at follow-up. However, her hearing function did not significantly improve.

DISCUSSION

In our patient, a unilateral tinnitus with an antecedent ipsilateral facial nerve injury, and a pre-existing hypertension and diabetes mellitus would likely support a secondary injury as cause for her tinnitus. The normal neuroimaging do not support a tumor of the peripheral audiovestibular nerve; an infarct of the anterior inferior cerebellar artery, or a central tinnitus from the basal ganglion, thalamus or pons.

Regarding use of gabapentin in tinnitus, there has been reports of a number of clinical trials and case studies (Table 1).[10-20] They provide valuable information although the indicator of clinical outcome is heterogeneous.[21] Overall, most of the studies do not support significant benefit of gabapentin in idiopathic subjective tinnitus[10-14], although a mild improvement has been reported in several cases series[15-16] and single case report.[17] A notable finding in these studies is the benefits of gabapentin in tinnitus of central type[18], acoustic trauma,[19], patients with concomitant cardiovascular risk factors[10], and after right ganglionic stroke.[20] The favorable response to gabapentin in our patient, suggests that gabapentin may be beneficial in tinnitus due to secondary cause at peripheral level.

The current theory of chronic tinnitus is a loss of central inhibition after deprivation of input from the ear (peripheral deafferentation).[22] Loss of input to the tonic inhibitory system releases excitatory structures from inhibitory regulation to auditory pathway resulting in tinnitus. In

Table 1: Summary of clinical trials of gabapentin in tinnitus

Author(s) Year	Patients	Results and comments
A. Positive benefit of gabapentin to tinnitus		
Chen & Yin (present case)	1 hypertensive and diabetic patient with right tinnitus after an ipsilateral peripheral facial palsy	Complete recovery of tinnitus after 100 mg/day of gabapentin
Chen & Yin (in press) (Ref. 20)	1 patient with bilateral tinnitus after right ganglionic hemorrhage	Reduction of 90% of tinnitus after 300 mg/day of gabapentin
Dehkordi *et al*. 2011 (Ref. 10)	40 idiopathic subjective tinnitus patients 40 controls	No difference in Tinnitus Severity Index and tinnitus loudness score between patients and controls. However, patients with hypertension, diabetes, and/or dyslipidemia showed a better response to gabapentin
Russel & Baloh 2009 (Ref. 15)	2 patients with brief, spontaneous, recurrent attacks of tinnitus and vertigo	Patients displayed a good response of tinnitus to low dose gabapentin
Bauer & Brozoski 2006 (Ref. 19)	19 tinnitus without acoustic trauma and 20 with acoustic trauma patients	Loudness decreased more significant in patients with acoustic trauma
Goldstein & Shulman 2003 (Ref. 16)	19 patients with tinnitus under gabapentin or clonazepam treatment	Improvement in tinnitus intensity index, tinnitus annoyance index, and tinnitus stress test score self-reported to physician but no change of tinnitus handicap inventory or depression scale
Shulman *et al*. 2002 (Ref. 18)	21 patients with central type of idiopathic subjective tinnitus receiving benzodiazepine or GABAergic drug including gabapentin	90% of patients had improvement in tinnitus and 48% of patients had improvement in brain perfusion, especially with medication directed to the GABA-benzodiazepine-chloride receptor
Zapp JJ 2001 (Ref. 17)	1 patient with idiopathic subjective tinnitus	75% improvement subjectively
B. No benefit of gabapentin to tinnitus		
Bakhshaee *et al*. 2008 (Ref. 11)	30 moderate to severe idiopathic subjective tinnitus patients 30 controls	No difference in tinnitus questionnaire, tinnitus severity index and the loudness perception between patients and controls
Piccirillo *et al*. 2007 (Ref. 12)	135 severe idiopathic subjective tinnitus patients receiving 900-3,600 mg/day of gabapentin for 8 weeks	No change in tinnitus Handicap Inventory score
Bahmad *et al*. 2006 (Ref. 13)	10 patients with placebo 10 patients with benzodiazepines 10 patients with benzodiazepines and GABAergic drugs including gabapentin	Patients on benzodiazepine, and benzodiazepine and GABAergic drugs have improvement of severe disable tinnitus of cochlear origin but no difference between the two groups
Witsell *et al*. 2007 (Ref. 14)	76 moderate nonpulsative idiopathic subjective tinnitus patients	No difference in Tinnitus Handicap Inventory

Ref.: Reference

acoustic trauma-induced tinnitus, a specific loss of γ-aminobutyric acid (GABA) function has been identified.[21] Gabapentin may thus improve secondary tinnitus through modulation of the GABAergic activity.

Our patient improved with low dose gabapentin. This is in contrast to previous reports based in Europe and US, where the tinnitus responded to a high dose of gabapentin.[10,15-19] Other than the patient in this report, there was another of our patients with ganglionic stroke who responded to low dose of gabapentin.[20] Our patients suggest that individual variation and ethnic difference may play a role in the response of gabapentin to sensorineural tinnitus.

DISCLOSURE

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