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Management of neurogenic tinnitus with associated myofascitis and hypertriglyceridemia

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Abstract
Background: Tinnitus is a common neurological symptom that can significantly impact quality of life, particularly when accompanied by dizziness and musculoskeletal complaints. This case illustrates the diagnostic approach and management of neurogenic tinnitus in a middle-aged female patient.
Case Presentation: A 51-year-old female presented with left-sided tinnitus and episodic dizziness for three months, along with chronic right shoulder pain. Comprehensive neurological and audiological evaluation was performed. The patient was successfully managed with neurotrophic support, analgesic therapy, and hyperbaric oxygen therapy.
Conclusion: Multimodal therapy including betahistine mesylate, mecobalamin, and hyperbaric oxygen therapy can effectively manage neurogenic tinnitus symptoms and improve patient quality of life.

Keywords: Neurogenic tinnitus, dizziness, myofascitis, betahistine, hyperbaric oxygen therapy

Introduction
Tinnitus affects approximately 10-15% of the adult population and can significantly impair sleep quality and daily functioning. Neurogenic tinnitus, in particular, requires careful diagnostic evaluation to exclude structural and vascular pathology. This case demonstrates the importance of comprehensive neurological assessment and multimodal therapeutic approach in managing chronic tinnitus with associated symptoms.

Case Presentation
Patient Information
A 51-year-old Han Chinese female employee presented to the Neurology Department of Dongying People's Hospital with a chief complaint of tinnitus accompanied by episodic dizziness for three months.

Clinical Findings
History of Present Illness: The patient developed tinnitus in the left ear several days before experiencing sleep disturbance. The tinnitus was characterized as a loud ringing sensation, particularly noticeable during quiet nighttime hours, significantly affecting sleep quality. The condition was accompanied by episodic dizziness described as a heavy-headed sensation lasting seconds to minutes, typically occurring upon standing. There was no associated fever, headache, nausea, vomiting, visual disturbances, diplopia, speech difficulties, limb convulsions, loss of consciousness, or sudden falls.

Past Medical History
- Right shoulder joint pain with limited mobility for over two months, previously treated with plaster therapy with unsatisfactory results
- Gastric polyp resection two years prior
- Uterine fibroid surgery more than 10 years prior
- No history of hypertension, diabetes, coronary heart disease, tuberculosis, hepatitis, or malaria
- No known drug or food allergies
- Received four doses of COVID-19 vaccine

Family History: Both parents were reported to be in good health. One younger brother in good health. No family history of genetic diseases or coronary heart disease.

Physical Examination on Admission

- **Vital signs:** Temperature 36.3°C, Pulse 69 bpm, Respiratory rate 17 bpm, Blood pressure 114/80 mmHg (right), 102/81 mmHg (left)
- **General:** Alert and conscious with normal cognition, memory, language function, and higher cortical functions
- **Cranial nerves:** Pupils equal, round, and reactive (3 mm diameter bilaterally); no ptosis, full extraocular movements; no nystagmus; normal facial sensation and movement; bilateral nasolabial folds symmetrical
- **Motor:** Muscle strength grade 5/5 in all extremities with normal tone
- **Sensory:** Normal superficial and deep sensation bilaterally
- **Reflexes:** Biceps and knee reflexes 2+ bilaterally; Hoffmann, Babinski, and Chaddock signs negative
- **Coordination:** Finger-to-nose and heel-to-knee tests stable and accurate
- **Romberg sign:** Negative with eyes open and closed
- **Neck:** Soft, no rigidity; Kernig and Brudzinski signs negative

Diagnostic Assessment

Laboratory Investigations

Hematology

Complete blood count: Within normal limits

- **White blood cells:** 7.51 × 10⁹/L (reference: 3.5-9.5)
- **Hemoglobin:** 132 g/L (reference: 115-150)
- **Platelets:** 242 × 10⁹/L (reference: 125-350)

Biochemistry

- **Triglycerides: 2.40 mmol/L (elevated; reference: 0.4-1.7)**
- **Total cholesterol:** 3.70 mmol/L (reference: 2.86-5.2)
- **High-density lipoprotein:** 0.80 mmol/L (low; reference: ≥1.04)
- **Low-density lipoprotein:** 2.25 mmol/L (reference: 2.07-3.37)
- **Homocysteine:** 8.5 μmol/L (reference: 5-15)
- **Liver function, renal function, and electrolytes:** Normal
- **Glycated hemoglobin:** 5.1% (reference: 3.6-6.0)

Coagulation profile

- Prothrombin time, INR, APTT, fibrinogen, D-dimer: All within normal limits

Other tests

- Thyroid function (TSH, free T3, free T4): Normal
- Tumor markers (AFP, CEA, ferritin): Normal
- Urinalysis: Normal

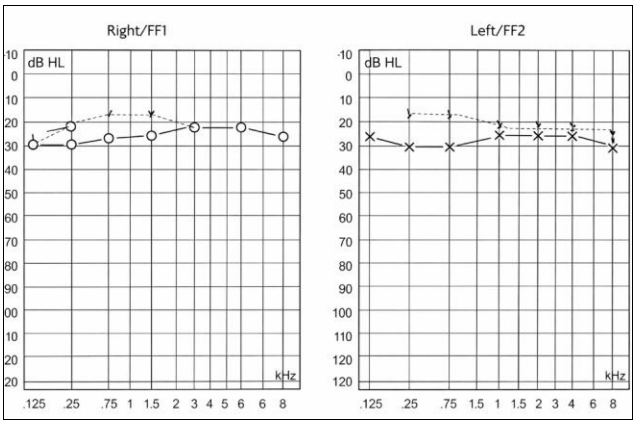
Audiological Assessment

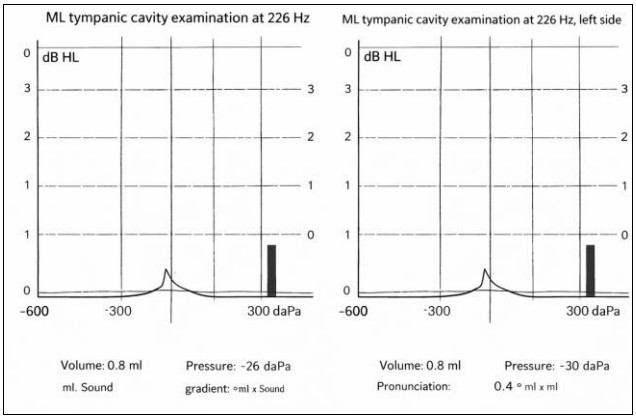
Pure-tone audiometry:

- **Right ear:** Mild hearing threshold elevation at 250 Hz (30 dB HL), 500-8000 Hz ranging from 20-30 dB HL
- **Left ear:** Hearing thresholds 15-25 dB HL across frequencies
- **Rinne test:** Air conduction > bone conduction bilaterally
- **Weber test:** Normal

Tympanometry (226 Hz)

- **Right ear:** Pressure -28 daPa, volume 0.84 ml
- **Left ear:** Pressure -33 daPa, volume 0.80 ml
- Findings suggestive of mild negative middle ear pressure bilaterally



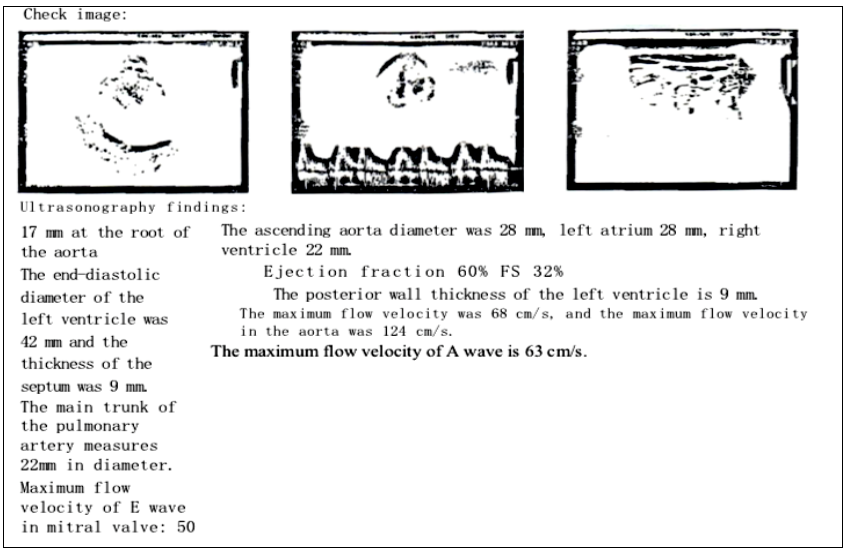


Imaging Studies

Electrocardiogram:

- Sinus rhythm, heart rate 82 bpm
- Slightly low T wave

Cardiac ultrasound: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Ultrasonography findings:

17 mm at the root of the aorta
The end-diastolic diameter of the left ventricle was 42 mm and the thickness of the septum was 9 mm.
The main trunk of the pulmonary artery measures 22mm in diameter.
Maximum flow velocity of E wave in mitral valve: 50

The ascending aorta diameter was 28 mm, left atrium 28 mm, right ventricle 22 mm.
Ejection fraction 60% FS 32%
The posterior wall thickness of the left ventricle is 9 mm.
The maximum flow velocity was 68 cm/s, and the maximum flow velocity in the aorta was 124 cm/s.
The maximum flow velocity of A wave is 63 cm/s.

Transcranial Doppler

- No abnormal blood flow detected in cerebral vessels

Carotid ultrasound

- Normal bilateral carotid artery dimensions
- No significant stenosis or atherosclerotic changes

Brain MRI (February 27, 2024)

- No significant abnormalities on plain scan
- Incidental finding: Right embryonic posterior cerebral artery (fetal-type variant)

Magnetic Resonance Angiography (MRA)

- Right posterior cerebral artery supplied by right internal carotid artery (fetal variant)
- No evidence of aneurysm, stenosis, or vascular malformation

Right shoulder MRI

- Small cystic lesion in right humeral head, suggestive of tendon sheath cyst
- Minimal fluid accumulation in right acromioclavicular bursa, deltoid bursa, subscapularis tendon, and long head of biceps tendon sheath
- Right acromioclavicular joint injury with degenerative changes
- Edema of soft tissues around right acromioclavicular joint

Differential Diagnosis

1. Neurogenic tinnitus (left ear) - Primary diagnosis based on audiometric findings and absence of structural abnormalities
2. Vascular tinnitus - Ruled out by normal vascular imaging
3. Ménière's disease - Less likely given the pattern of dizziness and audiometric findings
4. Acoustic neuroma - Excluded by normal brain MRI
5. Cervicogenic dizziness - Considered given cervical/shoulder myofascitis

Treatment

The patient received the following therapeutic interventions during hospitalization:

Pharmacological Management

1. **Betahistine mesylate tablets 12 mg orally three times daily** - For vestibular symptoms and tinnitus
2. **Mecobalamin tablets 0.5 mg orally three times daily** - Neurotrophic support
3. **Ginkgo biloba extract tablets 80 mg three times daily** - To improve cerebral circulation
4. **Eperisone tablets 50 mg three times daily** - Muscle relaxant for cervical/shoulder myofascitis
5. **Diclofenac sodium sustained-release tablets 75 mg once daily as needed** - Analgesia for shoulder pain

Non-pharmacological Interventions

- Hyperbaric oxygen therapy
- Level II nursing care
- VTE prophylaxis (low risk, basic preventive measures)

Lipid Management

- Dietary counseling for hypertriglyceridemia

Outcome and Follow-up

Discharge Status (March 4, 2024 - Hospital day 7)

The patient showed clinical improvement:

- No recurrence of dizziness episodes
- Tinnitus remained stable compared to initial assessment
- Normal appetite and sleep patterns restored
- Neurological examination remained normal
- Vital signs stable

Discharge Diagnoses
1. Neurogenic tinnitus (left)
2. Cervical and shoulder myofascitis
3. Hypertriglyceridemia
4. Post-operative status: Gastric polyp resection
5. Post-operative status: Uterine fibroid surgery

Discharge Instructions
1. Adequate rest with avoidance of overwork and moderate activity
2. Continue medications:
- Betahistine mesylate tablets 12 mg orally three times daily
- Mecobalamin tablets 0.5 mg orally three times daily
- Eperisone tablets 50 mg orally three times daily
- Diclofenac sodium sustained-release tablets 75 mg as needed for pain
3. Follow-up with joint surgery outpatient clinic for cervical/shoulder myofascitis
4. Continue hyperbaric oxygen therapy with ENT department follow-up
5. Neurology outpatient follow-up two weeks post-discharge
6. Immediate medical attention for any concerning symptoms

Discussion
This case illustrates several important aspects of neurogenic tinnitus management in clinical practice.

Clinical Significance
Neurogenic tinnitus represents a common but challenging clinical entity that requires comprehensive evaluation to exclude serious underlying pathology. In this patient, thorough neurological examination combined with audiological assessment and neuroimaging successfully identified the condition while ruling out structural causes such as acoustic neuroma, vascular malformations, or posterior circulation pathology.

Diagnostic Considerations
The incidental finding of a fetal-type posterior cerebral artery (embryonic/persistent posterior communicating artery supply to the PCA) deserves mention. This anatomical variant occurs in approximately 20-30% of the population and represents persistence of the fetal circulation pattern. While generally benign, such variants may theoretically contribute to altered hemodynamics, though direct causation of tinnitus is unlikely in this case given the unilateral nature of symptoms and normal transcranial Doppler findings.
The audiometric evaluation revealed mild bilateral hearing threshold elevations with negative middle ear pressure, suggesting possible Eustachian tube dysfunction contributing to the tinnitus perception. The absence of significant sensorineural hearing loss makes acoustic neuroma unlikely, which was confirmed by normal brain MRI.

Therapeutic Approach
The multimodal treatment strategy employed in this case reflects current evidence-based approaches to tinnitus management:
1. Betahistine mesylate is a histamine analogue with H1 agonist and H3 antagonist properties, commonly used for vestibular disorders. While evidence for tinnitus treatment is mixed, it may benefit patients with associated dizziness, as in this case.
2. Mecobalamin (vitamin B12 derivative) provides neurotrophic support and has been suggested to improve tinnitus in some patients, particularly those with nutritional deficiencies or neuropathic components.
3. Hyperbaric oxygen therapy has emerging evidence for acute tinnitus, though its efficacy in chronic tinnitus remains debated. The rationale involves improving cochlear oxygenation and reducing inflammation.
4. Addressing comorbidities including cervical/shoulder myofascitis and hypertriglyceridemia is essential, as musculoskeletal tension may exacerbate tinnitus perception, and metabolic factors could contribute to microvascular dysfunction.

Associated Conditions
The presence of hypertriglyceridemia (2.40 mmol/L) and low HDL cholesterol warrants attention, as dyslipidemia may contribute to microvascular disease affecting cochlear function. Lifestyle modifications and potential pharmacological management should be considered for cardiovascular risk reduction.
The cervical and shoulder myofascitis, while initially appearing unrelated, may contribute to tinnitus through somatic-auditory interactions. Cervicogenic mechanisms can modulate cochlear nucleus activity, and treatment of musculoskeletal dysfunction may provide additional benefit.

Limitations
This case report has several limitations. The relatively short hospital stay (7 days) provides limited follow-up data on long-term outcomes. Additionally, the stability of tinnitus rather than complete resolution suggests the need for continued monitoring and possible treatment adjustments. The lack of formal tinnitus severity assessment using validated instruments (e.g., Tinnitus Handicap Inventory) limits quantitative outcome evaluation.

Patient Perspective
Not documented in the medical record.

Informed Consent
Written informed consent was obtained from the patient for publication of this case report in accordance with institutional guidelines.

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Conflicts of Interest
The authors declare no conflicts of interest.

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Conclusion
This case demonstrates successful diagnosis and initial management of neurogenic tinnitus in a patient with multiple comorbidities. Key learning points include:

1. Comprehensive neurological and audiological evaluation is essential to exclude structural pathology
2. Multimodal therapy addressing both the tinnitus and associated conditions may provide optimal outcomes
3. Patient education and appropriate follow-up are crucial for long-term management
4. Incidental imaging findings require appropriate interpretation and contextualization

Further long-term follow-up would provide valuable information on sustained treatment efficacy and potential need for therapeutic modifications.

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