

Case Reports of Middle Ear Muscular Spasms Presenting as Tinnitus

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ABSTRACT

Background: Middle ear myoclonus (MEM) is an uncommon disorder characterised by involuntary spasms of the middle ear muscles, often manifesting as objective or pulsatile tinnitus. There are currently no standardised diagnosis or treatment methods, which may result in a chronic impairment in patients' quality of life despite intervention. This study seeks to characterize cases of MEM presented at a tertiary care clinic, with a focus on the diagnostic and management approaches employed. **Methods:** Two clinical cases of MEM were identified from the tinnitus clinic at the Department of Otorhinolaryngology - Head and Neck Surgery, SASMEC @IIUM. Cases were included if they involved patients who had been diagnosed with MEM-induced tinnitus and provided information on diagnostic processes and methods of treatment. **Results:** Two cases of MEM with either objective or subjective tinnitus were presented. Otoscopy and tympanometry were normal across cases, but differences emerged in the use of otoacoustic emissions (OAE), stapedial reflex testing, and pure tone audiometry for assessment. Some cases also utilized imaging to exclude other possible causes. Management strategies ranged from reassurance and pharmacological therapy to surgical tendon sectioning. The SASMEC@IIUM cases favoured conservative approaches: mainly reassurance, counselling, and ongoing monitoring, compared to the more invasive interventions reported in other institutions. **Conclusion:** The observed variability in the diagnosis and management of MEM underscores the lack of standardized clinical guidelines. To facilitate the development of evidence-based protocols, further research involving larger sample sizes and appropriately matched control groups is essential. Such efforts are likely to enhance diagnostic consistency and improve treatment outcomes for patients with MEM-induced tinnitus.

Keywords:

Middle ear myoclonus; tinnitus; audiological evaluation; audiological management

INTRODUCTION

Middle ear muscular spasm, also known as middle ear myoclonus (MEM), is an uncommon yet impactful condition that can lead to objective tinnitus, in which both the patient and examiner can hear the sound (Golz et al., 2003). Swain (2022) categorizes tinnitus, the perception of sound heard without an outside stimulus, as either subjective or objective. Objective tinnitus is far less common and typically results from mechanical or muscle activity within the ear, while subjective tinnitus is more

prevalent and associated with hearing loss (Bonaventurová et al., 2022; Golz et al., 2003). MEM-induced tinnitus specifically stems from involuntary contractions of muscles in the middle ear, notably the stapedius and tensor tympani (Ellenstein et al., 2013). Bonaventurová et al (2022) pointed out MEM-induced tinnitus is rare, accounting for only about 1.5% of newly diagnosed tinnitus cases.

This case report aims to explore the impact of MEM-triggered tinnitus on a patient's daily life, while also

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discussing the alignment of diagnostic and management approaches used at our centre with those reported in the literature. By examining both clinical outcomes and patient experience, the report seeks to improve understanding of MEM-induced tinnitus and suggest practical strategies for reducing its effect on quality of life.

MATERIALS AND METHODS

This study utilized a multiple clinical case report design, which facilitates the identification of shared and unique diagnostic and treatment features among patients, making it appropriate for reviewing retrospective data while also accounting for the most recent clinical outcomes.

Patient files from the Tinnitus Clinic, Department of Otorhinolaryngology - Head and Neck Surgery, SASMEC @IIUM (from now on referred to as Department of ORL-HNS) were screened to identify potential cases of MEM. Cases were reviewed with an Ear, Nose, and Throat (ENT) specialist where possible MEM cases were selected for each selected case, the patient's medical history, presenting symptoms, and clinical findings were documented. Challenges encountered in diagnosing MEM were also noted during the review process.

Each case was reviewed for audiological assessments such as pure tone audiometry (PTA) and tympanometry. In addition, tinnitus severity and psychological status were evaluated using the *Borang Evaluasi Selidik Tinnitus* (BEST) (Normani et al., 2017) and the Malay version of the Depression Anxiety Stress Scales-21 (DASS-21) (Musa et al., 2007), respectively. Information on treatments, medications, surgery, and alternative options was documented as well. Any other medical conditions that could be related to MEM or tinnitus were also considered. All of this was then discussed with the supervisory team to identify similarities and differences in symptoms, clinical assessment and management, and highlight aspects of good practice. This study was approved by the IIUM Research and Ethics Committee (IREC 2025-KAHS/DASLP8).

RESULTS

Case 1

Case 1 describes a case of 39-year-old Malay woman from the Department ORL-HNS, SASMEC@IIUM who developed left-sided tinnitus five years prior to the first appointment, following the birth of her third child. The tinnitus was triggered by sudden loud sounds, such as her children screaming in enclosed spaces. She also experienced hyperacusis on the affected side. She has been diagnosed with Graves' disease, with a strong family history involving her father and two siblings.

She came to the ENT clinic with complaints of worsening, intermittent left-sided tinnitus. The tinnitus episodes were brief and happened in response to loud acoustic stimulation (hearing her infant cry in a small, enclosed environment). She noted that the tinnitus symptoms began after a brief episode of vertigo and otalgia, which had spontaneously resolved. The vertigo, which was accompanied by brief bouts of imbalance, was produced by postural alterations. During the episode of brief vertigo, she denied experiencing accompanying symptoms such as fever, hearing loss, or ear discharge, but did report prolonged headphone use.

Clinical examination revealed normal otoscopic findings, with intact tympanic membranes. Nasal endoscopy showed minimal mucus accumulation in the nasopharynx. As shown in Figure 1, audiological testing confirmed normal pure tone hearing thresholds and Type A tympanograms in both ears, indicating normal middle ear function.

The initial management was by the ENT specialist which involved prescription of neurotropic vitamins and promoting continuous Valsalva manoeuvres which offered temporary relief. During a session with the audiologist that follows, she described the tinnitus as a soft buzzing and humming sound, triggered by loud noises but reduced in quiet environments. Her tinnitus was graded as very mild on BEST questionnaire, while Case 1's DASS-21 scores showed normal levels of depression and anxiety and mild level of stress. An impression of possible middle ear myoclonus was made by the audiologist, and she was counselled by both the audiologist and the ENT specialist.

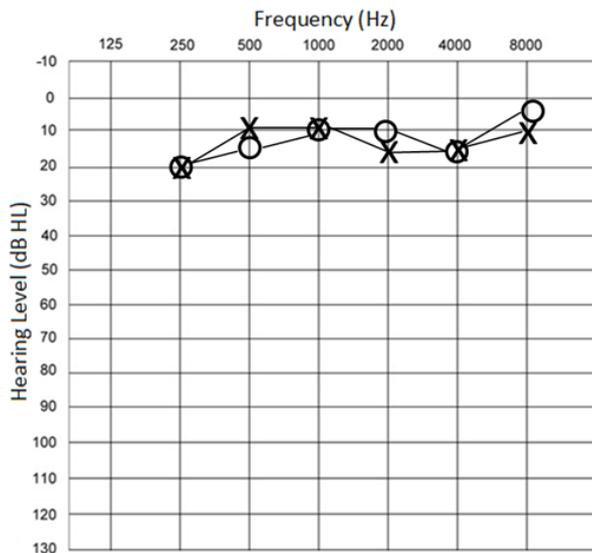


Figure 1. Audiogram of Case 1 showing normal hearing thresholds bilaterally.

Case 2

Case 2 details a 41-year-old Malay man who reported developing right-sided tinnitus after being exposed to a loud insect sound at home. He described the tinnitus as intermittent crackling noise in the right ear that became more noticeable over time, particularly in response to presence of high-pitched sounds. The episodes were also accompanied by headaches and mild giddiness. He denied any associated vertigo, facial palsy, blurred vision, ear discharge, or hearing loss. His medical history included cleft palate repair during infancy.

Figure 2 illustrates the pure tone audiometry findings which revealed essentially normal hearing in both ears. Tympanometry showed Type A tympanograms bilaterally, indicating normal middle ear function. The patient was initially managed by the ENT specialist with a combination of Betahistine hydrochloride and neurotropic vitamins.

Over time, the tinnitus episodes persisted, although they became less frequent and were shorter in duration. He described that the character of the tinnitus later changed to a high-pitched clicking, distorted in quality, and moderate in loudness. The episodes were consistently triggered by specific environmental sounds, including a passing lorry (when he is driving), loud music, his spouse's cough, and tap water splashing on the floor. The symptoms typically resolved shortly after the cessation of the triggering noise and were occasionally relieved by his

gentle stroking of hair around his ear.

The patient also observed that the tinnitus became softer during periods of intermittent fasting and worsened upon stopping fasting. He reported a subjective improvement in tinnitus intensity following regular intake of neurotropic vitamins. His BEST score reflected very mild tinnitus severity, and his DASS-21 scores were within normal limits. Based on the clinical presentation and response to sound triggers, an impression of possible MEM in the right ear was made by the audiologist. He was advised to continue taking the neurotropic vitamin supplement and maintain good hydration.

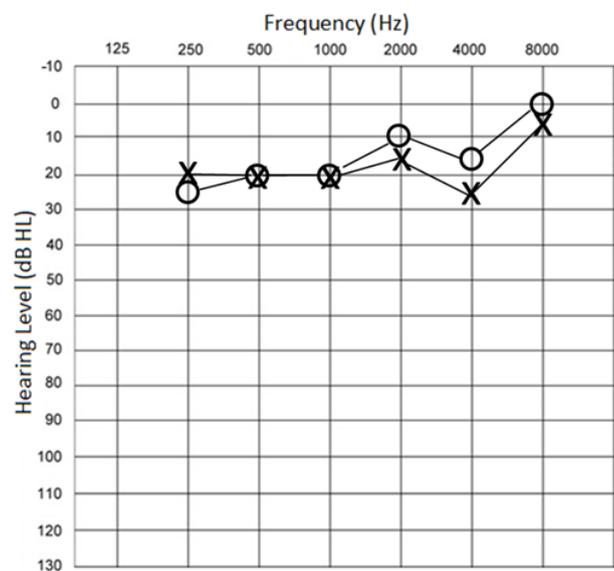


Figure 2. Audiogram of Patient B (Case 2) with essentially normal hearing bilaterally.

Discussion

The present study highlights how the rare condition of MEM can present with recognizable patterns and characteristics. Intermittent, loud-stimulus-induced tinnitus is a consistent feature reported both cases and serves as a powerful diagnostic signal for MEM. Although tinnitus in MEM may be described as buzzing, clicking, or tapping, it often shares mechanical, rhythmic, or percussive features, reflecting its muscular origin (Żyżyńska et al., 2025). From the cases reviewed, both patients experienced intermittent, stimulus-induced tinnitus. The characteristic of the tinnitus varies as it was described as buzzing or humming in Case 1 and crackling in Case 2. The description of clicking is similar to a case

reported by Badia et al. (1994), whereby a 31-year-old woman that was referred from neurological department due to suspicion of palatal myoclonus experienced an audible clicking noise and discomfort in her right ear (from now on referred to as Case 3). On the other hand, Zipfel et al. (2000) described a 44-year-old lady with a history of multiple sclerosis and middle ear myoclonus presented with intermittent “blowing” or “gushing wind” noise bilaterally (from now on referred to as Case 4).

Previous reports suggest symptoms may be worsened by environmental sounds such as loud noises, sudden sound exposure (e.g., an artillery blast, as described by Golz et al., 2003), or physical actions like eye closure or jaw movements (Bhimrao et al., 2012; Ferreira Bento et al., 1998; Ellenstein et al., 2013). This stimulus-triggered pattern is uncommon in typical subjective tinnitus, which is generally constant and internally generated, due to cochlear damage (Swain, 2022; Bonaventurová et al., 2022). Both cases 1 and 2 reported that the tinnitus was triggered by specific loud environmental sounds which is similar with another case reported by Badia et al. (1994) whereby a 28-year-old female reported hearing vibrating or tapping sounds in her left ear which were triggered by specific noises such as phone dial tones, fax machines, bird melodies, and music (from now on referred as Case 5).

Audiological findings revealed that PTA was at normal levels in both cases. This is consistent with Case 3 but differed from the Case 4 that demonstrated bilateral sloping high-frequency sensorineural hearing loss. Normal tympanograms, indicating normal middle function, were also similar features in both Cases 1 and 2. Unfortunately, due to lack of equipment, we are unable to report the middle ear acoustic reflex thresholds which could have provided valuable information regarding the function of the stapedius muscle in response to loud sounds. Case 4 reported rhythmic middle ear movements during tympanometry and physical examination, while Badia et al. (1994) described Case 3 as having normal stapedial reflexes and decay but inconsistent thresholds, suggesting intermittent stapedius involvement. Zipfel et al. (2000) emphasized the diagnostic complexity of MEM and the potential of AR testing. This is supported by Ellenstein et al. (2013) who stated that assessing the brainstem-mediated AR pathway may offer diagnostic insights, particularly in stapedius-related MEM.

Noise-related or stress-related triggers were also noted. In Case 1, tinnitus appeared postpartum and was associated with stress and prolonged headphone usage. Case 2 reported onset after hearing a loud cricket noise and observed that the duration of tinnitus varied during periods of intermittent fasting. Similarly, Case 5 described symptom aggravation linked to temporomandibular joint (TMJ) discomfort and personal stress.

Medical interventions were implemented in most cases. Neurotropic vitamins were prescribed in Cases 1 and 2. Additionally Case 2 also received Betahistine hydrochloride due to previous history of vertigo. In Case 3, benzodiazepines were administered, although they did not provide symptom relief. Surgical intervention, specifically tympanotomy with tendon sectioning, was performed in Cases 3 and 4. Additionally, Case 4 underwent ventilation tube insertion as an early attempt to manage the tinnitus, but it was unsuccessful. Non-pharmacological approaches were also explored. In Case 1, the Valsalva manoeuvre was recommended, while Case 5 focused on stress reduction strategies and received strong reassurance.

Divergent clinical outcomes were noted across the cases under review. In Case 1, the patient reported transient symptomatic relief following the application of the Valsalva manoeuvre. In Case 2, improvements in symptomatology were associated with the administration of neurotropic vitamin supplementation in conjunction with intermittent fasting. Notably, both individuals in Cases 1 and 2 presented with mild tinnitus severity, with Case 1 showing a mild level of stress based on DASS-21 and Case 2 demonstrated no psychological distress. Importantly, the inclusion of the psychological status provided additional insight into the psychosocial dimension of MEM, which was not systematically measured in earlier reports. Case 5, for example, strong reassurance helped reduce the psychological impact of the tinnitus, leading to a more manageable experience. These observations suggest that, in these particular instances, MEM may exert minimal influence on overall quality of life. In comparison, post-surgical relief was achieved in Cases 3 and 4, where both patients reported complete resolution of their tinnitus. Meanwhile, in Case 5, strong reassurance helped reduce the psychological impact of the tinnitus, leading to a more manageable experience.

CONCLUSION

MEM is a rare and frequently underdiagnosed condition, often obscured by its symptomatic overlap with other forms of tinnitus and typically normal audiological findings. However, its hallmark feature- stimulus-dependent, intermittent, and myogenic tinnitus- offer valuable diagnostic cues. MEM is multifactorial in origin, with neurological, psychological, structural, and hormonal influences necessitating comprehensive history taking and a patient-centered management approach. The two cases reported here add to the literature by incorporating standardized psychological assessments, which revealed minimal emotional burden despite persistent symptoms. This dimension, often overlooked in earlier reports, underscores the importance of evaluating both the clinical and psychosocial aspects of MEM. While conservative treatments such as pharmacotherapy and psychological support may suffice for non-objective cases, surgical intervention may be required for persistent or objective tinnitus to achieve lasting resolution. Accurate recognition of MEM's diverse presentations is essential to prevent misdiagnosis and ensure appropriate care. As clinical awareness grows, future research should focus on refining diagnostic criteria that include otological and audiological symptoms and establishing evidence-based treatment protocols that address both otological and psychological impact of MEM.

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REFERENCES

- Badia, L., Parikh, A., & Brookes, G. B. (1994). Management of middle ear myoclonus. In *The Journal of Laryngology and Otology* (Vol. 108).
- Bhimrao, S. K., Masterson, L., & Baguley, D. (2012). Systematic review of management strategies for middle ear myoclonus. In *Otolaryngology - Head and Neck Surgery (United States)* (Vol. 146, Issue 5, pp. 698–706). <https://doi.org/10.1177/0194599811434504>
- Bonaventurová, M., Bandúrová, V., Čada, Z., Plzák, J., &

- Balatková, Z. (2022). Middle ear myoclonus as a cause of objective tinnitus. In *Ceska a Slovenska Neurologie a Neurochirurgie* (Vol. 85, Issue 6, pp. 506–508). Czech Medical Association J.E. Purkyne. <https://doi.org/10.48095/cccsnn2022506>
- Ellenstein, A., Yusuf, N., & Hallett, M. (2013). *Reviews Middle Ear Myoclonus: Two Informative Cases and a Systematic Discussion of Myogenic Tinnitus*. <http://www.tremorjournal.org>
- Ferreira Bento, R., Ganz Sanchez, T., Miniti, A., archesi, T.-M., & Paulo, S. (1998). *Continuous, High-frequency Objective Tinnitus Caused by Middle Ear Myoclonus*.
- Golz, A., Fradis, M., Netzer, A., Ridder, G. J., Thomas Westerman, S., & Joachims, H. Z. (2003). Bilateral Tinnitus due to Middle-Ear Myoclonus. In *International Tinnitus Journal* (Vol. 9, Issue 1).
- Musa, R., Fadzil, M. A., & Zain, Z. A. I. N. I. (2007). Translation, validation and psychometric properties of Bahasa Malaysia version of the Depression Anxiety and Stress Scales (DASS). *ASEAN Journal of Psychiatry*, 8(2), 82-89.
- Normani, Z. M., Lau, Y. J., Wan, H. W. S., Lih, A. C., Nik, O. N. A., Salim, R., ... & Wan, M. W. N. (2017). Development and psychometric validation of a new tinnitus questionnaire for clinical use. *Auditory & Vestibular Research*. 26(2):71-85
- Sliwiska-kowalska, M. (2015). Chapter 19 - Hearing. In *Occupational Neurology* (Vol. 131).
- Swain, S. K. (2022). Middle ear myoclonus. *BLDE University Journal of Health Sciences*, 7(2), 179–183. https://doi.org/10.4103/bjhs.bjhs_137_21
- Zipfel, T. E., Kaza, S. R., & Greene, J. S. (2000). Clinical Records Middle-ear myoclonus. In *The Journal of Laryngology and Otology* (Vol. 114).
- Żyżyńska, K., Grycner, K., Tretiakow, D., & Skorek, A. (2025). Middle ear myoclonus syndrome—a literature review. *Polski Przegląd Otorinolaryngologiczny*, 14(1), 1-5.