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Case Report

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Cavernous Hemangioma With Right Vestibulopathy: A Case Report Illustrating Multidisciplinary Clinical Decision-Making in Vestibular Diagnostics

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Abstract

This paper describes a case study of a 56-year-old male patient with a small cavernous hemangioma and concurrent peripheral vestibular symptoms, initially thought to warrant neurosurgical intervention. A structured, multidisciplinary approach involving audiology, ear, nose and throat, and physiotherapy revealed that peripheral vestibular dysfunction, rather than the central lesion, was the primary cause of symptoms. The report illustrates the diagnostic utility of video head impulse testing (vHIT), caloric testing, and vestibular evoked myogenic potentials (VEMPs) in differentiating central and peripheral vestibular dysfunction, leading to a nonsurgical treatment plan. The case underscores the importance of multidisciplinary collaboration in preventing unnecessary interventions and highlights an effective clinical decision-making framework for similar cases.

Keywords: Vestibulopathy; Multidisciplinary team; Hemangioma; Differential diagnosis

Introduction

Navigating the intricate landscape of dizziness and vertigo presents a significant clinical challenge, underpinning the critical need for a nuanced and comprehensive differential diagnosis [1]. Vertigo and dizziness are frequent symptoms associated with diseases and conditions of varying origin, and a prevalence of 17-30% [2-4]. Hegemann and Palla [5] note the prevalence of dizziness as 20-30% in the general population across a lifetime. These symptoms are not merely common but are also emblematic of a complex interplay of physiological and pathological processes within the human body [6], making their accurate identification and management a pivotal concern for healthcare professionals, including general practitioners, ear, nose and throat (ENT) specialists, and audiologists [7]. The intricacies involved in diagnosing and treating such conditions demand a deep understanding of the multifaceted nature of balance disorders, which are influenced by a confluence of sensory inputs from the visual, proprioceptive, and vestibular systems [6].

In the specialized field of vestibular audiology, the focus is sharply on the complexities that arise in distinguishing the myriad causes of dizziness and vertigo, particularly when symptoms could be indicative of a broad range of disorders encompassing neurological, cardiovascular, psychiatric, and vestibular systems [8]. The diagnostic complexity appears to result in a protracted timeline, often spanning several years, before patients experiencing dizziness can obtain an accurate diagnosis, pointing to an underlying gap in the immediate and effective identification of such conditions [1].

A poignant example of diagnostic complexity and related challenges is seen in patients with cavernous hemangioma, particularly when it affects the vestibular system. Cavernous hemangioma is described as an intracranial vascular malformation that consists of a cluster of dilated and thin-walled capillaries with an endothelial lining and a fibrous connective tissue surrounding it [9]. The reported incidence rate is 0.15 - 0.56 per 100,000 persons per year [10]. Cavernous hemangiomas, with their proclivity for intracranial locations, manifest a range of symptoms from seizures and hemorrhages to vertigo, diplopia, and tinnitus, depending on their size, location, and the extent of hemorrhage [11]. The vestibular symptoms associated with cavernous hemangiomas, such as vertigo and imbalance, are particularly vexing due to their non-specific nature and the potential for overlap with a myriad of other vestibular disorders [12]. This creates a diagnostic conundrum where the precise identification of vestibular involvement in the context of a cavernous hemangioma becomes a complex puzzle, necessitating detailed and specialized assessment methods by a team of healthcare professionals.

The imperative for a multidisciplinary approach in tackling these challenges cannot be overstated. The World Health Organization (WHO) [13] advocates the concept of Interprofessional Education/Interprofessional Practice (IPE/IPP) in

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managing patients with balance disorders, underscoring the need for collaborative healthcare teams [14]. This multidisciplinary strategy is not just beneficial but essential in navigating the intricate path towards an accurate diagnosis, effectively reducing the likelihood of diagnostic errors and consequent patient harm [7]. Such an approach is especially crucial in complex cases like cavernous hemangioma, where the differential diagnosis encompasses a broad spectrum of potential conditions [15].

In the illustrated case, where a patient was initially diagnosed with a small, cavernous hemangioma leading to vertigo and imbalance, the diagnostic trajectory took a pivotal turn upon deeper examination within the multidisciplinary team. The team's expertise in vestibular function assessment revealed that irregularities in the peripheral vestibular system were primarily contributing to the patient's symptoms, steering the treatment strategy away from surgical intervention towards a tailored regimen of medical treatment supplemented by vestibular rehabilitation. This case exemplifies the transformative potential of a comprehensive, multidisciplinary diagnostic evaluation in determining the most appropriate management strategy, particularly in the intricate interface of vestibular audiology and conditions like cerebellar cavernous hemangioma. It highlights the indispensable role of specialized assessment in unravelling the complexities of vestibular symptoms and formulating an effective treatment plan that addresses the unique needs of each patient.

Case Report

Investigations

A 56-year-old man, with weight of 84 kg, height of 1.85 m, and a body mass index (BMI) of approximately 24.5 (within the normal range), experienced sudden onset of dizziness and imbalance with nausea and vomiting on May 30, 2022. These symptoms occurred 1 week after he had developed severe sinusitis. He has no history of smoking or alcohol consumption and has a medical history of asthma. He consulted with a healthcare practitioner, specializing as a physician who admitted him to hospital for 10 days. He was treated with antivirals and cortisone and referred for a magnetic resonance imaging (MRI) of the brain and high-resolution (HR) scan of the internal acoustic meatus. The imaging protocol performed on June 8, 2022 included multiplanar multi-sequence MRI of the brain pre- and postcontrast as well as 3D fast imaging employing steady-state acquisition (FIESTA) HR sequences of the temporal bone. Results revealed a focal small pop-corn-like lesion in the left cerebellar hemisphere, likely representing a small (11 × 9 mm) cavernous hemangioma, which prompted a referral to neurosurgery for potential removal. The neurosurgeon noted, however, that the patient's clinical symptoms were more consistent with peripheral vestibular dysfunction than with a lesion of the cerebellum. Typically, cerebellar hemangiomas may cause symptoms like ataxia or headache but are less commonly associated with peripheral-type vestibular symptoms. This discrepancy prompted the neurosurgeon to reconsider the initial surgical approach and instead opt for a comprehensive vestibular assessment by the audiological team to explore other potential causes for the patient's symptoms.

Diagnosis

Audiological consultation

The vestibular assessment was performed on June 21, 2022. The patient described his symptoms as feeling disoriented and off balance with "jumpy" vision most of the time. Symptoms increase with reduced visual and proprioceptive cues, riding in the car, and turning his head when walking. Associated symptoms include bilateral aural fullness, nausea, feeling of panic, developing memory and thinking problems as well as a sensation of swaying or being pulled down. The DizzyGuide Handicap Score (60%) suggested severe handicap as perceived by the patient. The reported handicap relates to a functional, emotional and physical involvement. The initial symptom clusters identified by the DizzyGuide included episodes of vertigo, tinnitus, aural fullness, and fluctuating hearing loss, which are hallmark indicators of Meniere's disease. The DizzyGuide is a web-based application designed to assist healthcare providers in evaluating and managing patients with balance disorders [16]. It allows patients to input their symptoms through structured questionnaires, and the tool employs an algorithm to analyze these symptoms and suggest potential differential diagnoses. In this case, the DizzyGuide algorithm flagged Meniere's disease as a potential diagnosis due to the specific combination of symptoms reported by the patient. The application's ability to correlate common symptom patterns with established clinical profiles makes it a valuable resource in the initial stages of diagnosing complex vestibular disorders. Furthermore, the patient's additional reports of anxiety and positional vertigo aligned with the typical presentation of Meniere's disease, prompting the clinical team to pursue further targeted vestibular assessments to confirm or rule out this diagnosis.

The patient reported bilateral tinnitus (worse in the left ear). His pure tone audiogram showed a bilateral moderate, steeply sloping, sensorineural hearing loss in the high frequency range, with an air-bone gap at 1 kHz. Tympanometry revealed a type A pattern (ear canal volume 0.5 - 1.5 cc; static compliance 0.3 - 1.6 cc; peak pressure -100 to +100 daPa) bilaterally. Acoustic reflex testing revealed responses between 70 and 90 dB SL for the low and mid-frequency range, specifically at 500, 1,000, and 2,000 Hz, both ipsilaterally and contralaterally. No responses were observed at the higher frequencies of 3,000 and 4,000 Hz. These results correlate with the patient's pure tone audiogram, which also showed a significant hearing loss at the higher frequencies. The vestibular audiological assessment included videonystagmography (VNG), ocular and cervical vestibular evoked myogenic potentials (oVEMP, cVEMP), video head impulse testing (vHIT) as well as electrocochleography (EcochG) (Supplementary Material 1, jocmr.elmerjournals.com).

VNG recordings were obtained using the ICS Chartr 200 VNG (Otometrics, a division of Natus Medical Incorporated,

Middleton, WI, USA) system with fixed lightbar and air caloric irrigator. The ICS Medical Videonystagmography instructional guide test protocol was followed to record and interpret the results [17]. Saccades were within the manufacturer specified normative ranges in terms of accuracy, latency and velocity. Tracking results revealed that the patient could follow moving objects smoothly and accurately without unexpected jerking movements or losing track of the object. It suggested that the visual and neurological systems involved in eye movement are healthy and performing as expected. Optokinetics tests indicated that the neural pathways and the muscles controlling eye movements are working effectively, allowing the eyes to maintain steady visual contact with moving objects. There was no spontaneous or gaze nystagmus at the time of testing. A static positional left beating nystagmus of 2 °/s was present in the supine position, with head to the right, head to the left, body to the right and body to the left. The nystagmus disappeared with fixation. Results from the tests for dynamic positioning nystagmus were within the normative range. Bithermal caloric testing showed a 62% asymmetry toward the right ear, further supporting the diagnosis of peripheral vestibular dysfunction. This finding was instrumental in confirming right-sided vestibular weakness.

cVEMP recording procedures used were identical to those described by Rosengren et al [18]. The ICS Chartr 200 (Otometrics a division of Natus Medical Incorporated, Middleton, USA) evoked potential system was used to deliver rarefaction tone burst stimuli through insert headphones unilaterally to each ear. The following stimulus parameters were used: 2,000 Hz tone burst stimuli, 5.1/s stimulus rate, and stimulus levels from 70 to 95 dBnHL. The patient elevated his head from a supine position to activate the sternocleidomastoid muscle during the recordings. The electromyography signal was then recorded from the surface disc electrodes placed on the skin halfway between the mastoid and the clavicle overlying the sternocleidomastoid muscle. Reference electrodes were placed on the lower forehead and the ground electrode was placed on the high forehead. The analysis time following each tone burst stimuli was 50 ms and the response was band-pass filtered from 10 to 1,000 Hz, with a total of 150 sweeps averaged and responses reproduced in a second run. The patient had symmetrical VEMP responses (asymmetry < 40 %) with expected latency, where P1 ranged between 13 and 17 ms and N1 between 18 and 22 ms, amplitudes between 75 and 150 µV, and thresholds ≥ 70 dB HL. The peak P1 latency was 14.85 ms for the left ear and 14.67 ms for the right ear. These values are consistent with the normative data provided by Rosengren et al (2019), which outlines typical VEMP response parameters in clinical practice.

oVEMP recording procedures used were identical to those described by Rosengren et al [18]. An ICS Chartr 200 (Otometrics a division of Natus Medical Incorporated, Middleton, USA) evoked potential system was used to deliver tone burst stimuli through insert headphones unilaterally to each ear. The following stimulus parameters were used: 750 Hz tone burst stimuli, 5.1/s Hz stimulus rate, and stimulus levels from 70 to 97 dBnHL. The patient was in a reclined position maintaining an upward gaze at 35° in order to activate the inferior oblique ocular muscle during the recordings. The electromyography signal was then recorded from the surface disc electrodes placed on the skin as close as possible underneath the eye in the orbital midline. Reference electrodes were placed on the lower forehead and the ground electrode was placed on the high forehead. The analysis time following each tone burst stimuli was 20 ms and the response was band-pass filtered from 1 to 1,000 Hz, with a total of 150 sweeps averaged and responses reproduced in a second run. The patient had symmetrical VEMP responses (< 40%) in terms of latency (< 18 ms), amplitudes (3 - 10 µV) and threshold (≥ 70 dB nHL).

The procedures for oVEMP and cVEMP recordings were largely based on the methods described by Rosengren et al (2019), with some adaptations to accommodate the specific clinical environment and equipment used. For instance, while Rosengren's protocol suggests a slightly different head positioning and stimulus rate, our approach utilized a stimulus rate of 5.1/s for cVEMP and 5.1/s for oVEMP to ensure optimal response quality given the patient's condition and the limitations of the equipment available at the time of testing. Additionally, the patient's head positioning during oVEMP recordings was slightly adjusted to maintain comfort and reduce muscle fatigue during the test. These adaptations were made to ensure reliable and reproducible results within the constraints of our clinical setting, while still adhering to the core principles outlined in the referenced methodology. Although 500 Hz is traditionally used in clinical settings, recent research indicates that higher frequencies, such as 750 Hz, may enhance the specificity of VEMP responses, particularly in assessing otolith function in patients with vestibular pathology [19]. The 750 Hz frequency provided a reliable response in this patient, aiding in the differentiation between central and peripheral vestibular involvement. Using this frequency allowed us to maintain diagnostic accuracy while accommodating individual patient characteristics and optimizing the specificity of the test.

vHIT recording procedures used were identical to those described by McGarvie et al [20]. This test was employed to assess the function of the horizontal and vertical semicircular canals. The ICS Impulse vHIT system was used to record eye movements while performing head impulses. The patient was seated in an upright position maintaining a gaze at a sticker on the wall at eye-level. vHIT goggles were tightly secured on the patient's head and calibration of the eye position was carried out. To stimulate the horizontal canals, quick lateral head movements were delivered to the patient by the operator. To stimulate the lateral anterior and right posterior (LARP) canals, the patient's head was pointed 30° - 40° to the right while maintaining fixation at the sticker as the operator delivered quick forward and backward head movements. To stimulate the right anterior and left posterior (RALP) canals, the patient's head was pointed 30° - 40° to the left while maintaining fixation at the sticker as the operator delivered quick forward and backward head movements. Gain was within the normative range of 0.8 - 1.0 for the left horizontal canal, anterior canals bilaterally as well as posterior canals bilaterally, with absence of covert or overt catch-up saccades. Gain for the right horizontal canal was reduced below 0.8 and both covert and overt catch-up saccades were visible. The reduced gain in the right horizontal canal and visible saccades indicated a peripheral vestibular deficit, directing the team towards a non-

central diagnosis.

EcochG recording procedures were performed and analyzed according to the Vanderbilt Audiology Clinics' protocol [21]. The ICS Chartr EP 200 (Otometrics a division of Natus Medical Incorporated, Middleton, USA) evoked potential system was used to deliver alternating clicks through insert headphones unilaterally to each ear. The following stimulus parameters were used: 7.1 Hz stimulus rate, and stimulus level 90 dBnHL. The patient was in a reclined position during the recordings. The electromyography signal was then recorded from the Tiptrode™ electrodes placed inside the external meatus, as possible to the tympanic membrane. The ground electrode was placed on the high forehead. The analysis time following each click was 10 ms and the response was band-pass filtered from 10 Hz to 1.5 kHz, with a total of 1,500 sweeps averaged, and responses reproduced in a second run. Wave morphology and repeatability was good bilaterally, with action potential (AP) and summation potential (SP) latencies within normative ranges. The SP/AP ratio as measured from a common stable baseline was within normative range for the left ear but enlarged for the right ear. The SP amplitude was enlarged to appear above the peak of the AP response. This is considered an indication of possible endolymphatic hydrops at the time of testing.

The combination of these diagnostic tools provided a comprehensive overview of the patient's vestibular function, which played a pivotal role in guiding the treatment plan. By integrating these assessments, the team achieved a high level of diagnostic accuracy, reducing the likelihood of misdiagnosis and preventing unnecessary neurosurgical intervention.

ENT consultation

The patient consulted with the ENT specialist on July 22, 2022. The patient no longer complained of tinnitus but experienced a mild to moderate tension type headache frontal, parietal and temporal. He also complained of chronic fatigue. During this consultation, the patient appeared very anxious and restless. Anti-depressant therapy had been prescribed previously to manage generalized anxiety, but he admitted to not taking it. Paroxetine (selective serotonin-reuptake inhibitor) and Vertin (anti-vertigo medicine which contains betahistine) was prescribed. The patient was encouraged to continue with vestibular rehabilitation therapy and requested to come back within 3 - 4 weeks.

Physiotherapy consultation

The patient was seen by a physiotherapist for vestibular rehabilitation on June 22, 2022. A functional gait assessment was done as a baseline balance assessment (score: 12/30). The patient's main complaint was feeling "foggy" or tired and off balance. In the first session, adaptation exercises were given (vestibular-ocular reflex (VOR) ×1) with a cognitive task (Stroop chart) in sitting as the patient could not safely do it in a standing position. Habituation exercises were also given in the form of body circles, wall rolls as well as gait with head movement as described by the American Institute of Balance. Lastly the patient was given substitution exercises in the form of one leg standing with open eyes on a firm surface. The patient was advised to do the exercises for 15 min at a time, three times per day. The patient returned 1 week later on June 28, 2022. In the second session, the patient reported that the exercises made him feel poorly but he was able to do them. All exercises were evaluated and progressed. VOR ×1 was progressed to standing. Wall rolls progressed to closed eyes, body circles in standing, one leg stance with closed eyes and tandem walking was introduced into gait with head movement.

The patient returned on July 5, 2022 for the third session. In this session, the patient reported feeling less foggy, but still tired. He was able to drive short distances with safety and felt slightly less of balance. The functional gait assessment was repeated with improvement (score: 16/30). Exercises were progressed to VOR ×2 in standing. One leg standing and gait with head movements while keeping balloon in the air. Cognitive tasks were still encouraged with all exercises. On July 19, 2022, the patient was seen for the fourth session. A metronome application was downloaded on his phone to increase the speed of VOR ×2 exercises. He was able to complete a cognitive task and VOR ×2 at the speed of 130 beats per minute (bpm) without any symptoms. Unstable surfaces were introduced with one leg stance and gait with head movements.

Treatment and follow-up

The progression plan from here will be to continue making exercises progressively more difficult, potentially introduce virtual reality training and include activities to improve concentration and function. The aim is to reintroduce the patient to the workplace as well as driving independently without anxiety or loss of balance. Future management might change as our focus is on the functional impairments of the individual caused by the dysfunction and not following an "one-size-fits-all" program [22].

The patient did not return to the ENT for a general follow-up until he started experiencing symptoms again, probably due to the 1-week lapse in taking his medication. On August 29, 2022, he consulted with the ENT who increased the dose for Vertin for 2 weeks, as well as cortisone for 5 days. The patients reacted well to the treatment and his symptoms were minimal when compliant to the management plan. The involvement of a psychologist was also discussed. The patient was, again, encouraged to continue with vestibular rehabilitation.

Discussion

The diagnostic evaluation of the patient's vestibular symptoms yielded intriguing results, notably from the lateral vHIT and caloric stimulation tests. Responses observed during the lateral vHIT with head movement towards the right and caloric stimulation of the right ear provided critical insights, indicating a potential dysfunction within the right horizontal

semicircular canal and/or the superior vestibular nerve. This finding was further supported by the presence of left beating nystagmus, which, despite its non-localizing nature without fixation, aligned with the suspected pathology in the right ear. Conversely, VEMP outcomes suggested intact otolith organs and vestibular nerve function, pointing towards a selective impairment of the right horizontal canal rather than a generalized vestibular dysfunction. The EcochG on the right suggested the presence of endolymphatic hydrops at the time of testing, a condition often associated with Meniere's disease and characterized by episodic vertigo, hearing loss, and tinnitus. Since the criteria established by the American Academy of Otolaryngology–Head and Neck Surgery (AAO-HNS) for a definitive diagnosis of Meniere's disease had not yet been fully satisfied, the final diagnosis was classified as "possible Meniere's disease". The AAO-HNS criteria emphasize the necessity of multiple definitive episodes of vertigo, hearing loss documented by audiometry, and tinnitus or aural fullness to confirm the diagnosis. As such, the diagnosis remains provisional, pending further clinical observation and assessment.

The possibility of Meniere's disease as the most probable diagnosis was considered based on the patient's clinical presentation, including episodic vertigo, aural fullness, fluctuating hearing loss, and tinnitus. While the diagnosis of Meniere's disease is largely clinical, radiological findings can sometimes provide supportive evidence, albeit non-specific. Although the MRI protocol did not include specific sequences to evaluate endolymphatic hydrops, it revealed no mass lesions or significant abnormalities apart from the small cerebellar hemangioma. The absence of radiological evidence of alternative pathologies strengthened the clinical suspicion of Meniere's disease. However, the lack of hydrops-specific imaging highlighted the diagnostic challenge in this case and the importance of correlating imaging findings with clinical assessments. In this case, the decision to focus on peripheral vestibular dysfunction was based on a combination of clinical presentation and comprehensive vestibular testing results, which aligned with the diagnostic criteria for probable Meniere's disease.

Given the initial impressions based on the imaging studies, the management strategy was oriented towards open brain surgery to remove the hemangioma. However, the involvement of a multidisciplinary team led to a more nuanced understanding of the patient's condition. The deeper dive into the patient's condition uncovered that the symptoms could be attributed to a peripheral vestibular cause. With this refined diagnosis, the team was able to pivot towards a less invasive and more targeted management approach. The focus shifted to medical management, including intratympanic injections and vestibular rehabilitation. The intratympanic injections were administered starting in early July 2022, following the comprehensive vestibular assessment and the initial multidisciplinary consultations. Vestibular rehabilitation commenced shortly after, with the first session on June 22, 2022, and continued through subsequent weeks as part of the ongoing management plan.

In line with the insights provided by Gans and Rutherford [22], the multidisciplinary team proved indispensable in navigating the complexities of vestibular disorders, offering the best chance for effective recovery. This approach is crucial for the differential diagnosis that informs the tailored management plan. Although lesions affecting the cerebellum can cause vertigo, nausea, vomiting as well as nystagmus, this particular case presented with more peripheral signs and symptoms. Central causes tend to have slower compensation, more neurological signs and imbalance, and general peripheral vestibular functioning [12]. Therefore, careful examinations including history taking as well as matching of central finding with clinical presentation are key in the differential diagnosis of central or peripheral (or both) causes of vertigo. This is more easily achieved when different professional experts in the field of balance and vertigo work together towards a common goal: to reduce diagnostic errors and provide the best patient care in line with a management plan that is based on a clear diagnosis.

The patient's management included a combination of vestibular rehabilitation and pharmacological therapy, notably betahistine (Vertin) and corticosteroids during acute episodes. Betahistine is widely used in the treatment of vestibular disorders, and its efficacy is thought to stem from its ability to increase blood flow in the inner ear and reduce endolymphatic pressure, thereby alleviating vertigo symptoms [23, 24]. Corticosteroids, on the other hand, have anti-inflammatory properties and are often prescribed for acute vestibular dysfunction to reduce inflammation and facilitate recovery of the vestibular nerve [25].

The patient's improvement in symptoms may be attributed, at least in part, to the combined effects of these medications alongside rehabilitation. The reported symptom recurrence following a 1-week lapse in medication adherence highlights the importance of consistent pharmacological management in vestibular disorders. While vestibular rehabilitation targets compensation and functional improvement, medication likely played a critical role in mitigating acute symptoms such as vertigo and imbalance. This underscores the need for clear patient education on the importance of adherence to prescribed pharmacological regimens, as lapses can potentially lead to symptom recurrence or delayed recovery.

Clinical implications and benefits of avoiding surgery

The avoidance of surgery in this case is a critical outcome, highlighting the role of a multidisciplinary approach in achieving accurate diagnosis and appropriate management. Surgical intervention, while often necessary for certain central lesions, was deemed unwarranted here given the peripheral nature of the patient's symptoms. Through comprehensive evaluation and collaborative decision-making, the team pursued a conservative treatment approach that minimized the patient's risk of complications, reduced recovery time, and provided effective symptom relief.

This case underscores the importance of multidisciplinary collaboration in vestibular diagnostics, especially in scenarios with overlapping central and peripheral symptoms. The team-based approach helped avoid an invasive intervention that could have resulted in extended recovery time and increased patient risk. This case serves as a model for clinicians managing similar cases where precise diagnosis and conservative management may significantly impact patient outcomes.

Limitations

The DizzyGuide handicap score and vHIT results after rehabilitation were not available.

Learning points

Multidisciplinary approach in complex vestibular cases

This case highlights the value of interdisciplinary collaboration for accurate diagnosis in cases with overlapping central and peripheral symptoms. Each specialist's expertise contributed to a more nuanced understanding of the patient's condition, helping avoid unnecessary surgical intervention.

Value of comprehensive vestibular assessment

The case illustrates the importance of combining vHIT, caloric testing, and VEMP in diagnosing vestibular dysfunction. This structured approach enabled the team to make informed clinical decisions and confirm the peripheral cause of the symptoms, thus avoiding a central misdiagnosis.

Clinical decision-making in avoiding unnecessary interventions

By integrating diagnostic results and leveraging team expertise, the decision to avoid surgery and focus on conservative management was validated. This framework provides a valuable model for clinicians facing similar diagnostic challenges, where accurate identification of vestibular pathology can have significant implications for patient management and outcome.

Supplementary Material

Suppl 1. Results from the vestibular audiological assessment.

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The authors have no funding to disclose.

Conflict of Interest

The authors declare no conflict of interest.

Informed Consent

Consent was obtained from the patient to use findings from the assessment for the case study presentation.

Author Contributions

AN and LB were involved in the assessment of the patient. The case was discussed by all authors. AN wrote the first draft and LB and AK contributed to subsequent drafts and revisions.

Data Availability

The authors declare that data supporting the findings of this study are available within the article.

Abbreviations

cVEMP: cervical vestibular evoked myogenic potential; EcochG: electrocochleography; ENT: ear, nose and throat; IPE/IPP: Interprofessional Education/Interprofessional Practice; MRI: magnetic resonance imaging; oVEMP: ocular vestibular evoked myogenic potential; vHIT: video head impulse testing; VNG: videonystagmography; VOR: vestibular-ocular reflex; WHO: World Health Organization

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