



**Vestibular Rehabilitation SIG
Archived Abstract of the Week
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January Topic: Horizontal Canal BPPV

January 5, 2022

Yu J, Gu Y, Meng G, et al. **Nystagmus Parameters of Supine Roll Test Correlates With Prognosis After Repositioning Maneuver in Horizontal Semicircular Canal Benign Paroxysmal Positional Vertigo.** *Front Neurol.* 2021;12:790430. Published 2021 December 6. doi:10.3389/fneur.2021.790430

Background: Positional nystagmus induced by supine roll test is characteristic for diagnosing horizontal semicircular canal benign paroxysmal positional vertigo (HC-BPPV). In this study, we aimed to explore the value of nystagmus parameters in by supine roll test (SRT) as prognostic factors in HC-BPPV.

Methods: We retrospectively analyzed the nystagmus parameters of 813 patients diagnosed with HC-BPPV by the SRT model in the SRM-IV system through video nystagmography. Then we used the computer-controlled canalith repositioning procedure (CCRP) mode for treatment. Based on the outcomes, patients were divided into either the cured group or the resistant group. The 1:1 propensity score matching (PSM) was applied to minimize potential selection bias. Then univariable and multivariable analyses were performed to identify the association of nystagmus parameters and the efficacy of CCRP.

Results: Among the 813 patients, 99 (12.2%) were classified in the resistant group. The right side of HC-BPPV patients was twice the number of the left side patients (537 vs. 276). PSM is used to pair resistant patients to the cured patients, in which 99 pairs were successfully matched. Results of univariate and multivariate analyses showed that patients in the resistant group have longer latency in the affected side [odds ratio (OR) = 1.231 (1.110-1.366); $P < 0.001$] and slower slow phase velocity (SPV) in the healthy side [OR = 0.957 (0.917-0.999); $P = 0.045$].

Conclusion: Nystagmus parameters may represent the characteristics of canalith. HC-BPPV patients with a longer latency in the affected side and slower SPV on the healthy side during SRT have a higher risk of HC-BPPV persisting after a single CCRP.

PMID: 34938267

January 12, 2022

Choi SY, Oh SW, Kim HJ, Kim JS. **Determinants for bedside lateralization of benign paroxysmal positional vertigo involving the horizontal semicircular canal.** *J Neurol.* 2020;267(6):1709-1714. doi:10.1007/s00415-020-09763-x

Objectives: This study aimed to define the factors affecting accuracy of bedside determination of the involved side in HC-BPPV.

Interventions: We developed 44 video clips including the nystagmus induced during supine head-roll test from patients with apogeotropic ($n = 23$) or geotropic ($n = 21$) HC-BPPV. The intensity of nystagmus



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was also quantified using video-oculography. Each video clip was presented twice to 25 participants, 14 medical students, and 11 medical personnel trained in neurology or neurotology, and the participants reported the lesion side using an evaluation sheet after each presentation. From the quantified video-oculographic data, absolute difference and asymmetry (absolute difference divided by the sum) of nystagmus intensity were calculated.

Main outcomes and measures: The accuracy of bedside lateralization of HC-BPPV was 83.5% after the first presentation, and 86.0% after the second presentation, and was not different between the medical students and trained personnel after the second presentation. The accuracy was more closely correlated with the asymmetry than the absolute difference (Spearman's $\rho = 0.627$, $p < 0.001$). With a cut-off for the asymmetry at 30.8%, the accuracy was estimated at 93.8% with a sensitivity of 92.9%, and the area under the ROC curve of 0.779.

Conclusions and relevance: The accuracy of bedside lateralization of the affected side is acceptable in HC-BPPV when the nystagmus asymmetry is more than 30%.

Keywords: Benign paroxysmal positional vertigo; Horizontal semicircular canal; Nystagmus; Vertigo.
PMID: 32100125

January 19, 2022

Mandalà M, Califano L, Casani AP, et al. **Double-Blind Randomized Trial on the Efficacy of the Forced Prolonged Position for Treatment of Lateral Canal Benign Paroxysmal Positional Vertigo.**

Laryngoscope. 2021;131(4):E1296-E1300. doi:10.1002/lary.28981

Objectives/hypothesis: The need for class I and II studies on the efficacy of liberatory maneuvers in the treatment of lateral canal benign paroxysmal positional vertigo (LC-BPPV) motivated the present double-blind randomized trial on the short-term efficacy of the forced prolonged position (FPP).

Study design: Double-blind, randomized controlled trial.

Methods: Two hundred twenty-one patients with unilateral LC-BPPV met the inclusion criteria for a multicentric study. Patients were randomly assigned to treatment by FPP (116 subjects) or sham treatment (105 subjects). Subjects were followed up at 24 hours with the supine roll test by blinded examiners.

Results: Among the sample, 67.4% and 32.6% of the patients showed respectively geotropic and apogeotropic variant of LC-BPPV. At the 24-hour follow-up, the effectiveness of FPP compared to the sham maneuver was, respectively, 57.8% versus 12.4% ($P < .0001$) in the total sample, 76.9% versus 11.3% ($P < .0001$) in the geotropic variant group, and 60.5% versus 17.6% ($P = .0003$) in the apogeotropic variant group, including resolution or transformation to geotropic variant.



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Conclusions: FPP proved highly effective compared to the sham maneuver. The present class 2 study of the efficacy of the FPP changes the level of recommendation of the method for treating LC-BPPV into a strong one.

Level of evidence: 2 Laryngoscope, 131:E1296-E1300, 2021.

Keywords: Benign paroxysmal positional vertigo; double-blind randomized trial; evidence-based; forced prolonged position maneuver; lateral canal; semicircular canals; vestibular.

PMID: 32822510

January 26, 2022

Zuma E Maia F, Ramos BF, Cal R, Brock CM, Mangabeira Albernaz PL, Strupp M. **Management of Lateral Semicircular Canal Benign Paroxysmal Positional Vertigo.** Front Neurol. 2020;11:1040. Published 2020 September 15. doi:10.3389/fneur.2020.01040

Benign paroxysmal positional vertigo (BPPV) is the most common cause of peripheral vestibular vertigo. It is caused by free-floating otoconia moving freely in one of the semicircular canals (canalolithiasis) or by otoliths adhered to the cupula (cupulolithiasis). The posterior canal is the most common canal affected, followed by the lateral canal. Diagnosis of the side affected is critical for successful treatment; therefore, suppressing visual fixation is essential to examination of these patients' eye movement. On the basis of our experience, we have adopted the Zuma maneuver and the modified Zuma maneuver for both apogeotropic and geotropic variants of lateral canal BPPV. Knowledge of the anatomy and pathophysiologic mechanisms of the semicircular canals is essential for correct management of these patients. Hence, using a single maneuver and its modification may facilitate daily neurotological practice.

Keywords: apogeotropic nystagmus; benign paroxysmal positional vertigo; canalolithiasis; cupulolithiasis; geotropic nystagmus; horizontal semicircular canal; lateral semicircular canal; repositioning maneuvers.

PMID: 33041982

February Topic: BPPV Updates

February 2, 2022

Lee, H. J., Ahn, S. K., Yim, C. D., Kim, D. H., & Hur, D. G. (2020). **Pseudo-spontaneous nystagmus in lateral semicircular canal benign paroxysmal positional vertigo: Correlation with bow and lean test in a pitch plane.** PLoS One, 15(11), e0242580.



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Objectives: We investigated the incidence and characteristics of pseudo-spontaneous nystagmus (PSN) in benign paroxysmal positional vertigo involving the lateral semicircular canal (LC-BPPV) and evaluated the correlation between PSN and the bow and lean test.

Methods: We examined nystagmus in the sitting position using video-oculography goggles in 131 LC-BPPV patients. The positioning test and bow and lean test were also performed. Patients were divided into canalolithiasis and cupulolithiasis groups according to the character of nystagmus. In each group, the incidence and direction of PSN, correlation with the bow and lean test, and treatment outcome were analyzed.

Results: PSN was observed in 25 cases (19.1%) in LC-BPPV patients, 7 of which were canalolithiasis and 18 of which were cupulolithiasis ($p = 0.098$). Of the 25 patients with PSN, 21 (84%) exhibited nystagmus consistent with the lean test whereas 4 (16%) exhibited nystagmus consistent with the bow test. In patients with PSN, nystagmus was observed in the bow and lean test in all cases (23/23), but in patients without PSN, no nystagmus was observed in 13 cases (13/87) in the bow and lean test ($p = 0.048$). The number of barbecue maneuvers performed until the end of treatment was 1.4 ± 0.7 in patients with PSN and 1.4 ± 0.9 in those without PSN ($p = 0.976$).

Conclusion: We identified PSN in patients with LC-BPPV irrelevant of subtype. Moreover, all patients with PSN showed nystagmus in the bow and lean test. The direction of PSN was mostly consistent with that of the lean test (21/25, 84%). The presence of PSN was not related to the treatment outcome in this study.

PMID: 33211765

February 9, 2022

Zanotti E, Yacovino DA. **Benign Paroxysmal Positional Vertigo: Canal Switching Affecting All Canals During a Single Session.** *Otol Neurotol.* 2021;42(1):e110. doi:10.1097/MAO.0000000000002853

Background: Benign paroxysmal positional vertigo (BPPV) is a common cause of vertigo, provoked by free moving otoliths inside of the semicircular canals. The expanded term “vestibular lithiasis” includes the six semicircular canals, all potentially vulnerable to BPPV. Since any canal could be spontaneously affected by the free moving otoliths in BPPV, as the inverse of the “vestibular lithiasis” theory, any canal could also be unintentionally involved during repositioning maneuvers. The following article is a case report of a 68-year-old female who encountered BPPV of each of the right semi-circular canals.

Methods: Patient was administered the modified Epley, the Yacovino and the Lempert maneuver in a single day for right posterior canal, superior (anterior canal) and horizontal canal BPPV respectively.

Conclusions: According to the “vestibular lithiasis” theory, all semicircular canals can be affected by free-moving otoconia, and an iatrogenic canal switching during the canal repositioning maneuvers is possible.



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PMID: 33211765

February 16, 2022

Jeong SH, Kim JS, Kim HJ, et al. **Prevention of benign paroxysmal positional vertigo with vitamin D supplementation: A randomized trial.** *Neurology.* 2020;95(9):e1117-e1125.
doi:10.1212/WNL.00000000000010343

Objective: To assess the effect of vitamin D and calcium supplementation in preventing recurrences of benign paroxysmal positional vertigo (BPPV).

Methods: We performed an investigator-initiated, blinded-outcome assessor, parallel, multicenter, randomized controlled trial in 8 hospitals between December 2013 and May 2017. Patients with confirmed BPPV were randomly assigned to the intervention (n = 518) or the observation (n = 532) group after successful treatment with canalith repositioning maneuvers. The primary outcome was the annual recurrence rate (ARR). Patients in the intervention group had taken vitamin D 400 IU and 500 mg of calcium carbonate twice a day for 1 year when serum vitamin D level was lower than 20 ng/mL. Patients in the observation group were assigned to follow-ups without further vitamin D evaluation or supplementation.

Results: The intervention group showed a reduction in the ARR (0.83 [95% confidence interval (CI), 0.74-0.92] vs 1.10 [95% CI, 1.00-1.19] recurrences per 1 person-year) with an incidence rate ratio of 0.76 (95% CI, 0.66-0.87, p < 0.001) and an absolute rate ratio of -0.27 (-0.40 to -0.14) from intention-to-treat analysis. The number needed to treat was 3.70 (95% CI, 2.50-7.14). The proportion of patients with recurrence was also lower in the intervention than in the observation group (37.8 vs 46.7%, p = 0.005).

Conclusions: Supplementation of vitamin D and calcium may be considered in patients with frequent attacks of BPPV, especially when serum vitamin D is subnormal.

Classification of evidence: This study provides Class III evidence that for patients with BPPV, vitamin D and calcium supplementation reduces recurrences of BPPV.

PMID: 32759193

February 23, 2022

Zhao P, Li J, Ding Y, Wang Y, Zou S. Li **Maneuver for geotropic horizontal canal benign paroxysmal positional vertigo (HC-BPPV) -A better choice.** *Am J Otolaryngol.* 2021;42(5):103132.
doi:10.1016/j.amjoto.2021.103132

Purpose: This study aimed to retrospectively evaluate the efficacy of Li Maneuver as a repositioning maneuver for geotropic HC-BPPV, compared with Gufon Maneuver.



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Methods: Data of geotropic HC-BPPV patients treated at our department between January 2009 and January 2020 was retrospectively collected and analyzed. Enrolled cases were divided into Gufoni Group and Li Group. Follow-up results were recorded on the first, third, and seventh day after the first therapeutic maneuver.

Results: A total of 254 cases were enrolled, with 87 cases in Gufoni Group, and 167 cases in Li Group. The cure rate at the first, third, and seventh days of follow-up was 62.22%, 77.01%, and 90.80% respectively for Gufoni Group, while for Li Group the number was 60.48%, 72.46%, and 89.22% respectively. Statistical analysis showed no significant difference.

Conclusions: Li Maneuver for geotropic HC-BPPV was as effective as Gufoni Maneuver but much simpler and faster. By introducing Li Maneuver, we may help physicians to treat geotropic HC-BPPV patients more willingly, which would decrease the chance of delayed treatment and ease the burden of the health-care system.

Keywords: Geotropic; Horizontal canal; Maneuver; Paroxysmal vertigo.
PMID: 34216878

March Topic: COVID-19

March 2, 2022

Shahidipour Z, Rouhbakhsh N, Tavanai E. **Auditory and Vestibular Complaints Among COVID-19 Patients: A Descriptive Survey of 300 Young Patients Over a 3-Month Follow-up Period.** *Modern Rehabilitation.* 2022;16(1):69-76.

Introduction: COVID-19 is a pandemic disease caused by a novel coronavirus, presenting a wide range of symptoms. Most of the reported symptoms are commonly related to the respiratory system; however, over time, the disease has shown new diverse signs and symptoms. Recent studies have suggested that COVID-19 may affect the auditory and vestibular systems. Besides, little is known about symptoms that persist after the recovery. This study aimed to investigate the general characteristics and especially auditory and vestibular symptoms in young COVID-19 patients over a 3-month follow-up.

Materials and Methods: A total of 300 participants aged 25-45 years took part in this cohort study. They were diagnosed with COVID-19, according to radiographical abnormalities on CT scan and or PCR test, and were in good health based on medical history. Patients who had a history of hearing loss, vertigo, tinnitus, or any disease associated with auditory and vestibular disorders and who were hospitalized and received drugs were excluded. We collected patients' demographics, some common symptoms, and their complaints (acute phase), and 1 month and 3 months later (follow-up phases) using a checklist of symptoms. The participants were asked to describe their chief complaints and, in particular, whether



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they had any complaints of hearing problems, tinnitus, rotatory vertigo, and aural fullness, or even changes in these symptoms over these periods.

Results: Auditory and vestibular symptoms were observed in a small percentage of COVID-19 patients and were not their chief complaints. Overall, among 300 patients, only about 5% of patients (15 cases) expressed rotatory vertigo, 4% (12 cases) aural fullness, 2.66% (8 cases) tinnitus, and 2.66% (8 cases) hearing problem in the acute phase. However, these symptoms disappeared almost in all participants in the follow-up phases (0 to 3 cases). In addition, none of these symptoms were the patients' chief complaints.

Conclusion: Only a small percentage of COVID-19 patients complained of auditory and vestibular symptoms. It needs to be determined whether these complaints are due to the effects of the virus itself, medications, or stress. The persistence of some symptoms, such as fatigue even after 3 months, indicates the long-term impact of the COVID-19 virus, which necessitates further studies.

<https://doi.org/10.18502/jmr.v16i1.8564>

March 9, 2022

Aldè M, Barozzi S, Di Bernardino F, et al. **Prevalence of symptoms in 1512 COVID-19 patients: have dizziness and vertigo been underestimated thus far?** [published online ahead of print, 2022 January 30]. Intern Emerg Med. 2022;1-11. doi:10.1007/s11739-022-02930-0

The relationship between SARS-CoV-2 infection and dizziness is still unclear. The aim of this study is to assess the prevalence and characteristics of dizziness and vertigo among patients with mild-to-moderate COVID-19. Patients discharged from the emergency rooms with a confirmed SARS-CoV-2 diagnosis were assisted by daily telephone calls until nasopharyngeal swab negativization, and specific symptoms concerning balance disorders were investigated through targeted questions posed by experienced physicians. The study included 1512 subjects (765 females, 747 males), with a median age of 51 ± 18.4 years. New-onset dizziness was reported by 251 (16.6%) patients, among whom 110 (43.8%) complained of lightheadedness, 70 (27.9%) of disequilibrium, 41 (16.3%) of presyncope, and 30 (12%) of vertigo. This study analyzed in detail the prevalence and pathophysiological mechanisms of the different types of balance disorders in a large sample, and the results suggest that dizziness should be included among the main symptoms of COVID-19 because one-sixth of patients reported this symptom, with females being significantly more affected than males (20.3 vs 12.9%, $P < 0.001$). Most cases of dizziness were attributable to lightheadedness, which was probably exacerbated by psychophysical stress following acute infection and mandatory quarantine. Vertigo should not be underestimated because it might underlie serious vestibular disorders, and disequilibrium in elderly individuals should be monitored due to the possible risk of falls.

Keywords: Balance Disorders; COVID-19; Dizziness; Presyncope; SARS-CoV-2; Vertigo.
PMID: 35098491



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March 16, 2022

Gervasoni F, LoMauro A, Ricci V, et al. **Balance and visual reliance in post-COVID syndrome patients assessed with a robotic system: a multi-sensory integration deficit.** *Neurol Sci.* 2022;43(1):85-88. doi:10.1007/s10072-021-05647-8

The symptoms of SARS-CoV-2 infection are not limited to the acute phase, with vertigo, peripheral neuropathies, headache, fatigue, memory loss, and depression being the most common post-acute clinical manifestations. Such post-COVID syndrome is a new clinically relevant challenge for diagnosis and therapy. Our goal was to quantify deficit in balance and proprioception related to post-COVID syndrome and, in this sense, we prospectively analyzed data of 66 post-COVID-19 outpatients (mean age 47.3 ± 11.1 years, 50 females, 25 hospitalized), evaluated using the robotic device hunova. The dynamic balance was assessed with open (OE) and closed eyes (CE) and three indexes, proportional to subject instability, were measured: the sway path and two oscillation ranges. Hospitalized group showed the worst performance with respect to non-hospitalized patients and normality range in both visual conditions for the sway path and the oscillation ranges, with the worst performance being with CE. When compared to normality ranges, post-COVID patients were significantly more distant from normality in the OE condition compared to the CE condition. These results suggest that independently from the severity of the disease experienced, post-COVID syndrome makes the elastic balance test performances more distant from the normality when the subject integrates vision, somatosensory information, and vestibular information. In the absence of visual feedback, patients seem to implement compensatory strategies, presumably seeking more significant feedback from the lower limbs, which improve their performance. These data suggest a new mechanism of the post-COVID syndrome that deserves further investigation for its potential impact on activities of daily living.

Keywords: Balance; Multi-sensory integration deficit; Post-COVID syndrome; Robotic system; SARS-CoV-2 infection.

PMID: 34613505

March 23, 2022

Almufarrij I, Munro KJ. One year on: **An updated systematic review of SARS-CoV-2, COVID-19 and audio-vestibular symptoms.** *Int J Audiol.* 2021;60(12):935-945. doi:10.1080/14992027.2021.1896793

Objective: The aim was to systematically review the literature to December 2020, in order to provide a timely summary of evidence on SARS-CoV-2, COVID-19 and audio-vestibular symptoms.

Design: The protocol was registered in the International Prospective Register of Systematic Reviews. The methods were developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines. Risk of bias was assessed using the National Institutes of Health quality assessment tools.



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Study sample: After rejecting 850 records, 28 case reports/series and 28 cross-sectional studies met the inclusion criteria.

Results: There are multiple reports of hearing loss (e.g. sudden sensorineural), tinnitus and rotatory vertigo in adults having a wide range of COVID-19 symptom severity. The pooled estimate of prevalence based primarily on retrospective recall of symptoms, was 7.6% (CI: 2.5-15.1), 14.8% (CI: 6.3-26.1) and 7.2% (CI: 0.01-26.4), for hearing loss, tinnitus and rotatory vertigo, respectively. However, these could be an over-estimate because it was not always clear that studies report a change in symptom.

Conclusion: There are multiple reports of audio-vestibular symptoms associated with COVID-19. However, there is a dearth of high-quality studies comparing COVID-19 cases and controls.

Review registration: Prospective Register of Systematic Reviews (PROSPERO); registration number CRD42020227038).

Keywords: Coronavirus; Covid-19; SARS-CoV-2; hearing loss; tinnitus; vertigo.
PMID: 33750252

March 30, 2022

Harrell RG, Schubert MC, Oxborough S, Whitney SL. **Vestibular Rehabilitation Telehealth During the SAEA-CoV-2 (COVID-19) Pandemic.** *Front Neurol.* 2022;12:781482. Published 2022 January 20.
doi:10.3389/fneur.2021.781482

During the COVID-19 pandemic, physical therapists transitioned to provide telehealth in the United States. We sought to determine the experiences of physical therapists delivering telerehabilitation for vestibular disorders including barriers, preferences, and concerns. A survey was created using the results of a focus group and previously published studies. The survey was distributed across social media sites and through email- the link was sent to the orthopedic, neurologic, and geriatric academies of the American Physical Therapy Association list serves. The email was also shared with each of the 50 state chapters of the American Physical Therapy Association. The survey was broken down into five sections: demographic information, physical therapists' general impressions of telehealth, physical therapists' comfort level treating various vestibular diagnoses, and common barriers physical therapists experienced during telehealth sessions. There were 159 completed surveys. More than 80% of physical therapists surveyed agreed that telehealth was an effective platform for vestibular physical therapy. When asked whether physical therapists felt the patient had similar health outcomes with telehealth versus clinic care 68% of physical therapists agreed. For the physical therapists who treated posterior or horizontal canal benign paroxysmal positional vertigo via telehealth, more than 50% were comfortable treating these conditions via telehealth. In analyzing common peripheral vestibular diagnoses treated via telehealth including bilateral vestibular loss, Meniere's disease, and vestibular neuritis more than 75% of the physical therapists reported comfort treating these diagnoses. Similarly, more than 75% of



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physical therapists who treated central vestibular diagnoses- including mild traumatic brain injury and vestibular migraine- via telehealth reported being comfortable treating these diagnoses. Physical therapists reported several barriers to telehealth ranging from concerns about testing balance with no caregiver present (94%) to challenges with providing a written home exercise program (33%). Physical therapists report that telehealth is a viable mechanism for providing rehabilitation for persons with balance and vestibular disorders. For common diagnoses, most physical therapists were comfortable treating vestibular disorders via telehealth. While barriers remain including maintaining patient safety and being able to complete a thorough vestibular exam, telehealth for vestibular physical therapy services holds promise for the delivery of virtual care.

Keywords: balance; dizziness; physical therapy; telehealth; vertigo; vestibular rehabilitation.
PMID: 35126289

April Topic: Vestibular Migraine

April 6, 2022

Perez-Carpena P, Lopez-Escamez JA. **Do we need to reconsider the classification of vestibular migraine?** Expert Rev Neurother. 2021;21(5):503-516. doi:10.1080/14737175.2021.1908129

Introduction: Vestibular migraine (VM) is a complex disease characterized by recurrent episodes of migraine associated with vertigo attacks that are observed in 1-3% of the general population. Given its high prevalence and the impact on the health system, it is important to characterize these patients, in order to offer an accurate diagnosis and a proper treatment. As the diagnosis of VM is based on clinical features, the study of potential biomarkers has gained more interest in the last years, to improve the precision in the diagnosis of this disease. The aim of this review is to summarize the main tests available for the diagnosis of VM, including the accuracy of biomarkers for the diagnosis of VM.

Areas covered: This review summarizes the main information on VM, including all diagnosis records published in the field in the last 10 years, and focusing on candidate biomarkers for the diagnosis of VM patients.

Expert opinion: There is a limited knowledge in the pathophysiology of VM. The search of biomarkers for diagnosis of VM is needed to improve the precision in the diagnosis promoting clinical and translational research. The potential reclassification of VM will depend upon the discovery and validation of these biomarkers.

Keywords: Clinical classification; biomarkers; diagnosis; patient characterization; vestibular migraine.



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PMID: 33755502

April 13, 2022

Pinheiro CF, Bevilaqua-Grossi D, Florencio LL, et al. **Is kinesiophobia related to fear of falling, dizziness disability, and migraine disability in patients with migraine?** [published online ahead of print, 2021 October 27]. *Physiother Theory Pract.* 2021;1-9. doi:10.1080/09593985.2021.1996496

Introduction: Kinesiophobia is a common symptom associated with high disability, and has been observed in patients with migraine. However, the association between kinesiophobia and clinical factors in this population is unknown.

Objective: To assess the fear of falling, dizziness disability, and migraine disability in patients with migraine, considering the presence of kinesiophobia.

Methods: Eighty patients with migraine completed the Tampa Scale for Kinesiophobia and were divided into two groups according to the questionnaire cutoff point: migraine without kinesiophobia (MoK, n = 39) and migraine with kinesiophobia (MK, n = 41). Fear of falling, dizziness disability, and migraine disability were assessed in both groups using validated questionnaires.

Results: The MK group presented higher scores on dizziness disability, fear of falling, and migraine disability compared to the MoK ($p < .05$). Kinesiophobia can explain 29% of the variance in dizziness disability and 18% of migraine disability. Both kinesiophobia and the presence of dizziness can explain 14% of fear of falling variability. Also, kinesiophobia is associated with the risk of presenting fear of falling (Prevalence Ratio = 2.4, $p = .012$), and migraine disability (Prevalence Ratio = 2.6, $p = .01$).

Conclusion: The presence of kinesiophobia should be considered in clinical practice when evaluating migraine, as it is associated with increased levels of fear of falling, dizziness disability, and migraine disability.

Keywords: Fear-avoidance; disability; dizziness; falls; headache.

PMID: 34704520

April 20, 2022

Kandil M, Jaber S, Desai D, et al. **MAGraine: Magnesium compared to conventional therapy for treatment of migraines.** *Am J Emerg Med.* 2021;39:28-33. doi:10.1016/j.ajem.2020.09.033

Due to the healthcare burden associated with migraines, prompt and effective treatment is vital to improve patient outcomes and ED workflow. This was a prospective, randomized, double-blind trial. Adults who presented to the ED with a diagnosis of migraine from August of 2019 to March of 2020



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were included. Pregnant patients, or with renal impairment were excluded. Patients were randomized to receive intravenous magnesium, prochlorperazine, or metoclopramide. The primary outcome was change in pain from baseline on a numeric rating scale (NRS) evaluated at 30 min after initiation of infusion of study drug. Secondary outcomes included NRS at 60 and 120 min, ED length of stay, necessity for rescue analgesia, and adverse effects. A total of 157 patients were analyzed in this study. Sixty-one patients received magnesium, 52 received prochlorperazine, and 44 received metoclopramide. Most patients were white females, and the median age was 36 years. Hypertension and migraines were the most common comorbidities, with a third of the patients reporting an aura. There was a median decrease in NRS at 30 min of three points across all three treatment arms. The median decrease in NRS (IQR) at 60 min was -4 (2-6) in the magnesium group, -3 (2-5) in the metoclopramide group, and -4.5 (2-7) in the prochlorperazine group ($p = 0.27$). There were no statistically significant differences in ED length of stay, rescue analgesia, or adverse effects. Reported adverse effects were dizziness, anxiety, and akathisia. No significant difference was observed in NRS at 30 min between magnesium, metoclopramide and prochlorperazine.

Keywords: Emergency department; Magnesium; Metoclopramide; Migraine; Prochlorperazine.
PMID: 33041146

April 27, 2022

Brandt T, Dieterich M. **'Excess anxiety' and 'less anxiety': both depend on vestibular function.** *Curr Opin Neurol.* 2020;33(1):136-141. doi:10.1097/WCO.0000000000000771

Purpose of review: To present evidence of a functional interrelation between the vestibular and the anxiety systems based on a complex reciprocally organized network. The review focuses on the differential effects of various vestibular disorders, on psychiatric comorbidity, and on anxiety related to vertigo.

Recent findings: Episodic vertigo syndromes such as vestibular migraine, vestibular paroxysmia, and Menière's disease are associated with a significant increase of psychiatric comorbidity, in particular anxiety/phobic disorders and depression. Chronic unilateral and bilateral vestibulopathy (BVP) do not exhibit a higher than normal psychiatric comorbidity. Anxiety related to the vertigo symptoms is also increased in episodic structural vestibular disorders but not in patients with chronic unilateral or bilateral loss of vestibular function. The lack of vertigo-related anxiety in BVP is a novel finding. Several studies have revealed special features related to anxiety in patients suffering from BVP: despite objectively impaired postural balance with frequent falls, they usually do not complain about fear of falling; they do not report an increased susceptibility to fear of heights; they do not have an increased psychiatric comorbidity; and they do not report increased anxiety related to the perceived vertigo. Subtle or moderate vestibular stimulation (by galvanic currents or use of a swing) may have beneficial effects on stress or mood state in healthy adults, and promote sleep in humans and rodents. The intimate structural and functional linkage of the vestibular and anxiety systems includes numerous



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nuclei, provincial and connector hubs, the thalamocortical network, and the cerebellum with many neural transmitter systems.

Summary: The different involvement of emotional processes and anxiety - to the extent of 'excess anxiety' or 'less anxiety' - in structural vestibular disorders may be due to the specific dysfunction and whether the system activity is excited or diminished. Both psychiatric comorbidity and vertigo-related anxiety are maximal with excitation and minimal with loss of peripheral vestibular function

PMID: 31743237

May Topic: BPPV Diagnosis and Treatment Updates

May 4, 2022

Özel HE, Karakuzu AT, Temir H, Alpay M, Özdoğan F, Genç S. **Effect of ocular fixation on positional nystagmus in BPPV patients** [published online ahead of print, 2022 April 19]. *Int J Audiol.* 2022;1-6. doi:10.1080/14992027.2022.2062579

Objective: The quantitative suppression rate of positional nystagmus (PN) by ocular fixation (OF) is unknown. This study aims to analyse the effect of OF on the slow phase velocity (SPV) of PN during diagnostic positional manoeuvres (DPMs) with videonystagmography in patients with benign paroxysmal positional vertigo (BPPV).

Design: DPMs were performed on 58 patients with BPPV, 33 (56.9%) of whom were women. OF was initiated when PN was most evident, and recording was continued. The mean SPV of three consecutive nystagmus before (F0) and after (F1) OF initiation was calculated. The rate of suppression of PN by OF was found in percent with the formula $(F0 - F1) \times 100/F0$.

Study sample: 58 patients were included in this study.

Results: The mean age was 56.1 ± 11.2 (range 27-76). F0 and F1 values were calculated as 5.742 ± 5.589 and 1.948 ± 3.424 degrees/second, respectively ($p < 0.001$). The rate of suppression of PN by OF was found to be 66.1%.

Conclusions: OF significantly suppresses PN during DPMs in BPPV patients. Elimination of OF during DPMs is important for accurate diagnosis.

Keywords: Benign paroxysmal positional vertigo; ocular fixation; positional nystagmus; videonystagmography.

PMID: 35438599



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May 11, 2022

Joshi D, Gyanpuri V, Pathak A, et al. **Gans repositioning maneuver for the posterior canal BPPV patients: systematic review and meta-analysis** [published online ahead of print, 2022 April 23]. Eur Arch Otorhinolaryngol. 2022;10.1007/s00405-022-07396-6. doi:10.1007/s00405-022-07396-6

Background and objectives: BPPV (benign paroxysmal positional vertigo) is a syndrome marked by brief bouts of vertigo accompanied by rapid changes in head position. Recent ongoing therapeutic approaches used are vestibular rehabilitation exercises and physical maneuvers like the Epley maneuver, Semont maneuver. Gans repositioning maneuver (GRM) is a new hybrid maneuver, consisting of safe and comfortable series of postures that can be conveniently applied on patients with any spinal pathology or even in elderly.

Methods: Randomized controlled/clinical trials of the Gans maneuver were identified. The proportion of patients who improved as a result of each intervention was assessed, as well as the conversion of a 'positive' Dix-Hallpike test to a 'negative' Dix-Hallpike test.

Results: Improvement was seen in almost all patients with the Gans maneuver and the Epley Maneuver in three trials with the pooled estimate for random effect model is 1.12 [0.87; 1.43: 100%]. There were no significant side effects from the treatment.

Discussion: This study shows that the Gans maneuver is a safe and effective treatment for patients suffering from posterior canal BPPV.

Keywords: Benign paroxysmal positional vertigo; Epley maneuver; Gans maneuver; Review.
PMID: 35460377

May 18, 2022

Franco-Gutiérrez V, Pérez-Guillén V, Gil-Aguilar MT, et al. **Comparative analysis of the efficiency of two treatment protocols for posterior canal benign paroxysmal positional vertigo** [published online ahead of print, 2021 Jan 19]. **Análisis comparativo de la eficiencia de dos protocolos de tratamiento del vértigo posicional paroxístico benigno del conducto semicircular posterior** [published online ahead of print, 2021 Jan 19]. Acta Otorrinolaringol Esp (Engl Ed). 2021;S0001-6519(20)30201-6. doi:10.1016/j.otorri.2020.11.006

Background and objectives: Benign paroxysmal positional vertigo (BPPV) is the most common vertigo of labyrinthine origin, its social and healthcare impact is remarkable. It has recently been shown that single session treatment is as safe and effective as weekly treatment, which could have impact on direct and indirect costs related to the disease. The objective of this study is to determine whether single session



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treatment of unilateral posterior canal BPPV canalolithiasis is more efficient than conventional treatment.

Materials and methods: A prospective randomized controlled trial was performed in 53 consecutive patients diagnosed with unilateral posterior canal BPPV canalolithiasis previously untreated: 26 patients were assigned to single session treatment and 27 patients to weekly treatment. Average and total cost of care, consultation time and the impact in terms of temporary disability and loss of productivity for the company due to patients' medical visits were compared.

Results: Average and total cost of care and loss of productivity for the company due to patients' medical visits were significantly lower in the single session group. Consultation time was also better in this group when travelling time was considered.

Discussion: The single session protocol is fast, effective and reduces direct and indirect cost of care related to disease justifying high resolution consultations.

Keywords: BPPV; Costes indirectos; Costes sanitarios; Efficiency; Eficiencia; Healthcare cost; Indirect cost; Tratamiento; Treatment; VPPB.

PMID: 33483093

May 25, 2022

Imai T, Inohara H. **Benign paroxysmal positional vertigo** [published online ahead of print, 2022 April 3]. *Auris Nasus Larynx*. 2022;S0385-8146(22)00066-9. doi:10.1016/j.anl.2022.03.012

Benign paroxysmal positional vertigo (BPPV) is characterized by positional vertigo (brief attacks of rotatory vertigo triggered by head position changes in the direction of gravity) and is the most common peripheral cause of vertigo. There are two types of BPPV pathophysiology: canalolithiasis and cupulolithiasis. In canalolithiasis, otoconial debris is detached from the otolithic membrane and floats freely within the endolymph of the canal. In cupulolithiasis, the otoconial debris released from the otolithic membrane settles on the cupula of the semicircular canal and the specific gravity of the cupula is increased. Consensus has been reached regarding three subtypes of BPPV: posterior-canal-type BPPV (canalolithiasis), lateral-canal-type BPPV (canalolithiasis) and lateral-canal-type BPPV (cupulolithiasis). In the interview-based medical examination of BPPV, questions regarding the characteristics of vertigo, triggered movement of vertigo, duration of vertigo and cochlear symptoms during vertigo attacks are important for the diagnosis of BPPV. The Dix-Hallpike test is a positioning nystagmus test used for diagnosis of posterior-canal-type BPPV. The head roll test is a positional nystagmus test used for diagnosis of lateral-canal-type BPPV. When the Dix-Hallpike test is repeated, positional nystagmus and the feeling of vertigo typically become weaker. This phenomenon is called BPPV fatigue. The effect of BPPV fatigue typically disappears within 30 min, at which point the Dix-Hallpike test again induces clear positional nystagmus even though BPPV fatigue had previously caused the positional nystagmus to



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disappear. For the treatment of BPPV, sequential head movements of patients can cause the otoconial debris in the semicircular canal to move to the utricle. This series of head movements is called the canalith repositioning procedure (CRP). The appropriate type of CRP depends on the semicircular canal in which the otoconial debris is located. The CRP for posterior-canal-type BPPV is called the Epley maneuver, and the CRP for lateral-canal-type BPPV is called the Gufoni maneuver. Including a time interval between each head position in the Epley maneuver reduces the immediate effect of the maneuver. This finding can inform the development of methods for reducing the effort exerted by doctors and the discomfort experienced by patients with posterior-canal-type BPPV during the Epley maneuver.

Keywords: BPPV fatigue; Canalolithiasis; Cupulolithiasis; Epley maneuver; Gufoni maneuver.
PMID: 35387740

June Topic: Meniere's Disease

June 1, 2022

Basura GJ, Adams ME, Monfared A, et al. **Clinical Practice Guideline: Ménière's Disease.** *Otolaryngol Head Neck Surg.* 2020;162(2_suppl):S1-S55. doi:10.1177/0194599820909438

Objective: Ménière's disease (MD) is a clinical condition defined by spontaneous vertigo attacks (each lasting 20 minutes to 12 hours) with documented low- to midfrequency sensorineural hearing loss in the affected ear before, during, or after one of the episodes of vertigo. It also presents with fluctuating aural symptoms (hearing loss, tinnitus, or ear fullness) in the affected ear. The underlying etiology of MD is not completely clear, yet it has been associated with inner ear fluid (endolymph) volume increases, culminating in episodic ear symptoms (vertigo, fluctuating hearing loss, tinnitus, and aural fullness). Physical examination findings are often unremarkable, and audiometric testing may or may not show low- to midfrequency sensorineural hearing loss. Conventional imaging, if performed, is also typically normal. The goals of MD treatment are to prevent or reduce vertigo severity and frequency; relieve or prevent hearing loss, tinnitus, and aural fullness; and improve quality of life. Treatment approaches to MD are many and typically include modifications of lifestyle factors (eg, diet) and medical, surgical, or a combination of therapies.

Purpose: The primary purpose of this clinical practice guideline is to improve the quality of the diagnostic workup and treatment outcomes of MD. To achieve this purpose, the goals of this guideline are to use the best available published scientific and/or clinical evidence to enhance diagnostic accuracy and appropriate therapeutic interventions (medical and surgical) while reducing unindicated diagnostic testing and/or imaging.



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Keywords: Meniett device; electrocochleography; endolymphatic hydrops; endolymphatic sac decompression; fluctuating aural symptoms; gentamicin; labyrinthectomy; quality of life; sensorineural hearing loss; sodium-restricted diet; vestibular testing.
PMID: 32267799

June 8, 2022

Hannigan IP, Welgampola MS, Watson SRD. **Dissociation of caloric and head impulse tests: a marker of Meniere's disease.** J Neurol. 2021;268(2):431-439. doi:10.1007/s00415-019-09431-9

A retrospective analysis of the horizontal video head impulse test (vHIT) results and caloric testing results was undertaken on 644 patients who attended a neuro-otology outpatient facility. Presenting symptoms included spontaneous vertigo, positional vertigo, imbalance or chronic subjective dizziness. For 570 patients, the results of vHIT and caloric testing were concordant. Both tests were normal in 500 subjects with an average vHIT gain = 0.92 ± 0.09 (L); 0.98 ± 0.10 (R) and canal paresis (CP) = 7.88 ± 6.12 ; (range 0-28%). 54 had concordant asymmetries, average ipsilesional vHIT gain = 0.56 ± 0.15 , average contralesional vHIT gain = 0.88 ± 0.12 . CP = 68.02 ± 24.38 (range 31-100%). 16 subjects had bilateral vestibular hypofunction with average vHIT gains of 0.42 ± 0.20 (L); 0.41 ± 0.19 (R), peak slow phase velocity (SPV) on warm caloric testing = 2.68 ± 2.08 , range $0-6^\circ/s$ (L) and 3.75 ± 3.43 range, $0-10^\circ/s$ (R). 36 patients showed a dissociation of results between the two tests. In these subjects, the vHIT gain was normal (0.93 ± 0.06 left and 0.98 ± 0.07 right) and the caloric test showed a CP > 30% ($48 \pm 13.8\%$). Their final diagnoses included clinically definite Meniere's disease (MD) (n = 27), vestibular schwannoma (VS) (n = 2) vestibular migraine (VM) (n = 1), vestibular neuritis (VN) (n = 5) and unknown (n = 1). No patient with abnormal HSCC gain on vHIT had a normal caloric result. The caloric test complements the vHIT in the assessment of vestibular disorders and is most useful in suspected endolymphatic hydrops. Asymmetric caloric function in the presence of normal horizontal head impulse tests is most commonly associated with Meniere's disease and may function as a diagnostic marker.

Keywords: Caloric testing; Dissociation; Meniere's disease; Video head impulse test.
PMID: 31222419

June 15, 2022

Kutlubaev MA, Xu Y, Hornibrook J. **Benign paroxysmal positional vertigo in Meniere's disease: systematic review and meta-analysis of frequency and clinical characteristics.** J Neurol. 2021;268(5):1608-1614. doi:10.1007/s00415-019-09502-x

There is a recognized association of Meniere's disease (MD) and benign paroxysmal positional vertigo (BPPV). However, the frequency and clinical characteristics of BPPV in MD are unclear. The aim of this review was to determine the mean frequency and clinical features of BPPV in MD. Three databases were searched: MEDLINE, PubMed and Google Academia. Studies reporting the frequency of BPPV in MD were pooled. A total of 4198 references were identified, of which 20 studies were considered eligible.



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The pooled frequency of BPPV in MD was 14% (95% CI 9-18%). It was 38% (95% CI 26-49%) in longitudinal studies and 8% (95% CI 6-11%) in cross-sectional ones. BPPV comorbid with MD was mostly observed in the ear affected by hydrops, in females, in patients with more advanced disease. Canalolithiasis of the horizontal semicircular canal was more common in patients with BPPV associated with MD than in idiopathic BPPV. BPPV in MD was more prone to recurrence and required more canal repositioning maneuvers.

Keywords: Benign paroxysmal positional vertigo; Hydrops; Meniere's disease; Otolithiasis; Vertigo.
PMID: 31410549

June 22, 2022

Teggi, R., Gatti, O., Familiari, M., Cangiano, I., & Bussi, M. (2021). **Skull Vibration-Induced Nystagmus Test (SVINT) in Vestibular Migraine and Menière's Disease**. *Audiology Research*, 11(4), 603-608.

Background: Vestibular migraine (VM) and Menière's disease (MD) are the two most frequent episodic types of vertigo apart from Benign Paroxysmal Positional Vertigo (BPPV). Differential diagnosis between VM and MD may be troublesome in the early stages. A skull vibration-induced nystagmus test (SVINT) is a newly proposed vestibular test, which has demonstrated to be fast and reliable in confirming diagnoses of certain peripheral vestibular disorders. The purpose of the study is to assess if the SVINT can be utilized in differentiating between VM and MD.

Methods: A retrospective study was conducted on 200 patients diagnosed with VM from 2005 to 2020. These patients were compared to 605 patients diagnosed with MD from 2010 to 2019. All patients were diagnosed according to the criteria set by The Barany Society. The SVINT was performed at a frequency of 100 Hz with a commercially available system (VVIB—Synapsis). Stimuli were applied perpendicularly to the skin over the mastoid process, with a force around 1 kg while the patient was sitting, and three stimulation trials were performed on each mastoid, lasting 5–10 s each. The test was considered positive only when nystagmus was elicited in all six trials, always beating on the same side. Eye movements were recorded with video Frenzel goggles and visual fixation of both eyes was inhibited.

Results: 59.2% of MD subjects presented as positive with SVINT while only 6% did so with VM; among other tests, only video HIT demonstrated a different frequency in the two groups (13.1% and 0.5%, respectively).

Conclusions: Since SVINT demonstrated to be positive in a peripheral vestibular deficit in previous works, we think that our data are consistent with the hypothesis that, in the pathophysiology of VM attacks, the central vestibular pathways are mainly involved.

PMID: 34842606

June 29, 2022



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Hoskin JL. **Ménière's disease: new guidelines, subtypes, imaging, and more.** *Curr Opin Neurol.* 2022;35(1):90-97. doi:10.1097/WCO.0000000000001021

Purpose of review: This article reviews recent developments in Ménière's disease including etiologic, diagnostic, and therapeutic investigations that have changed the landscape for medical providers. These updates shed light onto the complex nature of Ménière's disease and generate additional means to provide optimal care to patients.

Recent findings: Given the multifactorial cause of Ménière's disease, five subtypes of Ménière's disease have recently been proposed. A knowledge of these subtypes will aid in the development of an appropriate treatment algorithm. Although newer treatments have not been developed, stepwise treatment algorithms have been proposed and can improve patient care. New MRI modalities and serum testing hold promise as clinical clues and biomarkers.

Summary: As these updated diagnostic criteria are used, Ménière's disease can be identified and treated more precisely. This will in turn allow for future randomized controlled studies to improve the quality of treatment options available. Future imaging, vestibular testing, and the potential for serum biomarkers may illuminate additional diagnostic criteria, only furthering the improvement in clinical care.

PMID: 34864755

July Topic: Pediatrics and Vestibular Disorders

July 6, 2022

Grasso A, Poropat F, Kamagni Vodié T, Ghirardo S, Barbi E. **How Age Matters in the Assessment of Vertigo in the Pediatric Emergency Department: A 10-Year Age-Stratified Etiology Survey.** *Pediatr Emerg Care.* 2022 Jan 1;38(1):e43-e46. doi: 10.1097/PEC.0000000000002242. PMID: 32947561.

Vertigo is a relatively frequent cause for referral to the pediatric emergency department, and it is usually caused by benign or self-limiting etiology. However, it could be difficult to evaluate especially in the younger child and could also conceal serious illness as encephalitis or cerebellitis. Our survey collected in a 10-year period 757 children assessed in pediatric emergency department for vertigo and stratified this population for etiology and for group of age: younger than 6 years (113, 14.9%), between 7 and 12 years (251, 33.2%), and older than 12 years (393, 51.9%). In addition, associated signs and symptoms, evaluation by a neurologist or an otorhinolaryngologist, and instrumental investigations were recorded. We found that age is the most important variable to assess the possibility of a central nervous system disease as etiology cause of vertigo with a significant difference of incidence between the younger group (younger than 6 years, 23%) and older groups (3% and 1%; $P < 0.001$). This finding should reinforce the index of suspicion for a central nervous system illness as cause of vertigo in the preschool children with



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an accurate workup including evaluation by a neurologist or an otorhinolaryngologist and instrumental investigations as needed.

PMID: 32947561

July 14, 2022

van de Berg R, Widdershoven J, Bisdorff A, et al. **Vestibular Migraine of Childhood and Recurrent Vertigo of Childhood: Diagnostic criteria Consensus document of the Committee for the Classification of Vestibular Disorders of the Bárány Society and the International Headache Society.** J Vestib Res. 2021;31(1):1-9. doi:10.3233/VES-200003

This paper describes the diagnostic criteria for "Vestibular Migraine of Childhood", "probable Vestibular Migraine of Childhood" and "Recurrent Vertigo of Childhood" as put forth by the Committee for the Classification of Vestibular Disorders of the Bárány Society (ICVD) and the Migraine Classification subgroup of the International Headache Society. Migraine plays an important role in some subgroups of children with recurrent vertigo. In this classification paper a spectrum of three disorders is described in which the migraine component varies from definite to possibly absent. These three disorders are: Vestibular Migraine of Childhood, probable Vestibular Migraine of Childhood and Recurrent Vertigo of Childhood. The criteria for Vestibular Migraine of Childhood (VMC) include (A) at least five episodes with vestibular symptoms of moderate or severe intensity, lasting between five minutes and 72 hours, (B) a current or past history of migraine with or without aura, and (C) at least half of episodes are associated with at least one migraine feature. Probable Vestibular Migraine of Childhood (probable VMC) is considered when at least three episodes with vestibular symptoms of moderate or severe intensity, lasting between five minutes and 72 hours, are accompanied by at least criterion B or C from the VMC criteria. Recurrent Vertigo of Childhood (RVC) is diagnosed in case of at least three episodes with vestibular symptoms of moderate or severe intensity, lasting between 1 minute and 72 hours, and none of the criteria B and C for VMC are applicable. For all disorders, the age of the individual needs to be below 18 years old. It is recommended that future research should particularly focus on RVC, in order to investigate and identify possible subtypes and its links or its absence thereof with migraine.

PMID: 33386837

August 03, 2023

ÇILDIR, B. (2021). **An age-related investigation of audio-vestibular symptoms in individuals with COVID-19 positive.** Cukurova Medical Journal, 46(4), 1537-1547. <https://doi.org/10.17826/cumj.987374>

An age-related investigation of audio-vestibular symptoms in individuals with Covid-19 positive

Purpose: The aim of this study was to determine the rate of audio-vestibular complaints by COVID-19 patients during the disease period and to evaluate the symptoms they encountered during the disease process in accordance with age and gender. Materials and Methods: This study was conducted with a total of 1437 patients (738 M, 699 F) with a positive PCR test, aged 18–80 years, between June 15 2020



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and February 10 2021. The patients were divided into five groups according to age. 1437 patients were questioned about their complaints on the second day of the disease, but only 656 of 1437 patients were questioned on the fourteenth day of the disease. Finally, 1437 patients were called again for the third time in the third month of the disease, but only 340 of these patients could be reached. Results: Of the 1437 patients, 524 (36.5%) had more frequent audio-vestibular complaints than common complaints. During the 14-day disease period, dizziness or vertigo (3.4% to 19.4%), tinnitus (1.02% to 19.4%), pressure in the ears (1.1% to 5.6%), difficulty understanding speech in noise (0.13% to 26%), decreased sound tolerance (0.13% to 6.4%), speech difficulties (0.13% to 5%), and earache (1.4% to 7.8%) reportedly increased compared with the first day of the disease. Fifty-two (15.3%) of 340 patients reported that they lost their sense of taste, 90 (26.4%) lost their sense of smell, and 14 (4.11%) reported intermittent vertigo in the third month of COVID-19 infection. Conclusion: Symptoms such as dizziness, tinnitus, hoarseness, swallowing difficulty, fever, and decreased sound tolerance can often be seen in the later days of COVID-19 disease.

Keywords

Tinnitus, vertigo, coronavirus, COVID-19, speech and swallowing disorder

PMID: 33386837

August Topic: Vestibular Paroxysmia

August 10, 2022

Karamitros A, Kalamatianos T, Stranjalis G, Anagnostou E. **Vestibular paroxysmia: Clinical features and imaging findings; a literature review.** J Neuroradiol. 2022;49(2):225-233.

doi:10.1016/j.neurad.2021.07.007

According to the definition of neurovascular compression syndromes (NVCS), a vascular structure in direct contact with a cranial nerve is causing mechanical irritation of the neural tissue producing correlating symptoms. Vestibular paroxysmia is an example of a neurovascular compression which is caused by neurovascular contact between the eighth cranial nerve and a vessel. It is crucial to understand the unique anatomy of the vestibulocochlear nerve in order to study the syndrome which is the result of its compression. More specifically, the long transitional zone between central and peripheral myelin plays a central role in clinical significance, as the transitional zone is the structure most prone to mechanical injury. Imaging techniques of the eighth cranial nerve and the surrounding structures are substantial for the demonstration of clinically significant cases and potential surgical decompression. The goal of the current review is to present and study the existing literature on vestibular paroxysmia and to search for the most appropriate imaging technique for the syndrome. An extensive literature search of PubMed database was performed, and the studies were ranked based on evidence-based criteria, followed by descriptive statistics of the data. The present analysis indicates that 3D CISS MRI sequence is superior to any other sequence, in the most studies reviewed, regarding the imaging of neurovascular compression of the eighth cranial nerve.



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Keywords: 3D CISS MRI; Neurovascular compression syndromes; Vertigo; Vestibular disorders; Vestibular paroxysmia.
PMID: 34364914

August 17, 2022

Steinmetz K, Becker-Bense S, Strobl R, Grill E, Seelos K, Huppert D. **Vestibular paroxysmia: clinical characteristics and long-term course** [published online ahead of print, 2022 May 20]. J Neurol. 2022;10.1007/s00415-022-11151-6.

In 2016, the Bárány Society defined new diagnostic criteria for the neurovascular compression syndrome of the eighth nerve, called "vestibular paroxysmia" (VP), differentiating between definite (dVP) and probable (pVP) forms. The aim of this study was (1) to describe clinical symptoms and laboratory findings in a well-diagnosed large patient cohort according to those criteria, and (2) to evaluate the long-term course over years in dVP. We identified 146 patients (73 dVP, 73 pVP) from our tertiary dizziness center registry. Data of structured history-taking, clinical neurological, neuro-ophthalmological/otological examinations as well as MRI imaging were extracted for analyses. Overall, attack frequency ranged between 5 and 30 attacks per day; spinning vertigo was the most frequent type. In two-thirds of patients, attacks occurred spontaneously; in one-quarter, they were triggered by head movements. The majority (approximately 70%) reported no accompanying symptoms; in those with symptoms, mild unilateral cochlear symptoms prevailed. One-third of patients initially showed hyperventilation-induced nystagmus without specific direction, and a deviation of the subjective visual vertical between 3° and 6°. Complete loss of peripheral vestibular function was never evident. dVP and pVP significantly differed concerning the vertigo type, e.g., spinning vertigo was more frequent in dVP. Fortunately, three-quarters of dVP patients remained attack-free during follow-up (mean 4.8 years, standardized questionnaire), more than half of them even without any medication. Patients with ongoing attacks showed significantly higher attack frequency at baseline, but reported persistent frequency reduction. Overall, the long-term prognosis of VP appears favorable, not necessarily requiring ongoing treatment.

Keywords: Long-term course; Neurovascular compression; Symptomatology; Vestibular paroxysmia; Vestibular testing.

PMID: 35595969

August 24, 2022

Hanskamp LAJ, Schermer TR, van Leeuwen RB. **Long-term Prognosis of Vertigo Attacks and Health-related Quality of Life Limitations in Patients With Vestibular Paroxysmia**. Otol Neurotol. 2022;43(4):e475-e481. doi:10.1097/MAO.0000000000003465

Objective: To explore the long-term course of outcomes in vestibular paroxysmia (VP).



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Study design: Cross-sectional observational study with a retrospective collection of baseline data.

Setting: Tertiary referral center.

Patients: Adult patients who visited the Apeldoorn Dizziness Center between 2010 and 2020 and were diagnosed with definite or probable VP according to the Bárány Society criteria were contacted by telephone to complete a study-specific questionnaire. Baseline data were retrospectively collected from patients electronic medical records to allow comparison between baseline and follow-up data.

Main outcome measures: Vertigo attack frequency, use of carbamazepine and health-related quality of life (HRQoL) limitations were the primary outcomes. Secondary outcomes were the number of attack-free years and perceived effect of medication for VP.

Results: Seventy three patients were included, 61 (84%) of whom agreed to participate in the follow-up study. Mean age was 55.0 (SD 13.1) years, 49.2% were females. Mean follow-up was 3.4 years (range 0.4-11.3). At follow-up, 44 responders (72%) still experienced vertigo attacks. Average attack frequency in the past 6 months was 307 (SD 451) at baseline and 153 (SD 279) at follow-up ($p = 0.050$). At follow-up, 19.7% ($n = 12$) of the responders reported to use or have used carbamazepine, 58% of patients who (had) used this medication reported a positive perceived effect. Overall, 71% ($n = 31$) of the responders reported to have limitations in one or more HRQoL items due to their VP.

Conclusion: Our study shows a rather unfavorable prognosis in patients with VP in terms of vertigo attacks and HRQoL limitations. After the initial diagnosis follow-up is warranted to monitor clinical outcomes in these patients.

PMID: 34999619

August 31, 2022

Idriss SA, Thai-Van H, Altaisan R, Ltaief-Boudrigua A, Reynard P, Ionescu EC. **The Narrowed Internal Auditory Canal: A Distinct Etiology of Pediatric Vestibular Paroxysmia.** J Clin Med. 2022;11(15):4300. Published 2022 Jul 25. doi:10.3390/jcm11154300

Vestibular paroxysmia (VP) is a disorder encountered in the pediatric population that etiology has been attributed to neurovascular cross-compression syndrome (NVCC). The purpose of this study was to report a new probable pathological condition, the narrowed internal auditory canal (IAC), which appears to be involved in the development of a clinical picture of VP in the pediatric population. A retrospective descriptive comparative study was conducted to compare clinical, electrophysiological, radiological, and therapeutic outcomes in both etiologies. Overall, 16 pediatric patients suffering from VP were included and divided into two groups: patients with narrowed internal auditory (Group 1) were compared to those with NVCC syndrome (Group 2). Patients in both groups were similar in terms of auditory



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complaints, as well as hearing, vestibular, and electrophysiological status. A narrowed IAC was encountered in the adolescent age category and females, especially those with rapid growth. The diagnosis requires a careful analysis of the shape and diameters of the IAC. Radiologic measurements in the axial plane do not seem to be sufficient to confirm the diagnosis, and, therefore, an analysis of diameters in the coronal plane is required. Treatment with sodium-channel blockers drugs showed promising results not only by relieving vertigo but also by normalizing the electrophysiological findings. In conclusion, a narrowed IAC can be considered in patients suffering from VP.

Keywords: anticonvulsant drugs; cochleovestibular nerve; narrowed internal auditory canal; neurovascular compression syndrome; pediatric vertigo; vestibular paroxysmia.

PMID: 35893390

September Topic: Acute Dizziness in the ED

September 07, 2022

Nakatsuka M, Molloy EE. **The HINTS examination and STANDING algorithm in acute vestibular syndrome: A systematic review and meta-analysis involving frontline point-of-care emergency physicians.** PLoS One. 2022;17(5):e0266252. Published 2022 May 5. doi:10.1371/journal.pone.0266252

This systematic review aims to evaluate whether point-of-care emergency physicians, without special equipment, can perform the HINTS examination or STANDING algorithm to differentiate between central and non-central vertigo in acute vestibular syndrome with diagnostic accuracy and reliability comparable to more specialized physicians (neuro-ophthalmologists and neuro-otologists). Previous research has concluded that emergency physicians are unable to utilize the HINTS examination with sufficient accuracy, without providing any appropriate education or training. A comprehensive systematic search was performed using MEDLINE, Embase, the Cochrane CENTRAL register of controlled trials, Web of Science Core Collection, Scopus, Google Scholar, the World Health Organization International Clinical Trials Registry Platform, and conference programs and abstracts from six medical organizations. Of the 1,757 results, only 21 were eligible for full-text screening. Two further studies were identified by a manual search of references and an electronic search for any missed studies associated with the authors. Five studies were included in the qualitative synthesis. For the STANDING algorithm, there were two studies of 450 patients who were examined by 11 emergency physicians. Our meta-analysis showed that emergency physicians who had received prior education and training were able to utilize the STANDING algorithm with a sensitivity of 0.96 (95% confidence interval: 0.87-1.00) and a specificity of 0.88 (0.85-0.91). No data was available for the HINTS examination. When emergency physicians are educated and trained, they can use the STANDING algorithm with confidence. There is a



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lack of evidence regarding the HINTS examination; however, two ongoing studies seek to remedy this deficit.

PMID: 35511910

September 14, 2022

Nham B, Akdal G, Young AS, et al. **Capturing nystagmus in the emergency room: posterior circulation stroke versus acute vestibular neuritis** [published online ahead of print, 2022 Jul 18]. *J Neurol.* 2022;10.1007/s00415-022-11202-y. doi:10.1007/s00415-022-11202-y

Objectives: To compare acute nystagmus characteristics of posterior circulation stroke (PCS) and acute vestibular neuritis (AVN) in the emergency room (ER) within 24 h of presentation.

Methods: ER-based video-nystagmography (VNG) was conducted, recording ictal nystagmus in 101 patients with PCS (on imaging) and 104 patients with AVN, diagnosed on accepted clinical and vestibular test criteria.

Results: Patients with stroke in the brainstem (38/101, affecting midbrain (n = 7), pons (n = 19), and medulla (n = 12)), cerebellum (31/101), both (15/101) or other locations (17/101) were recruited. Common PCS territories included posterior-inferior-cerebellar-artery (41/101), pontine perforators (18/101), multiple-territories (17/101) and anterior-inferior-cerebellar-artery (7/101). In PCS, 44/101 patients had no spontaneous nystagmus. Remaining PCS patients had primary position horizontal (44/101), vertical (8/101) and torsional (5/101) nystagmus. Horizontal nystagmus was 50% ipsiversive and 50% contraversive in lateralised PCS. Most PCS patients with horizontal nystagmus (28/44) had unidirectional "peripheral-appearing" nystagmus. 32/101 of PCS patients had gaze-evoked nystagmus. AVN affected the superior, inferior or both divisions of the vestibular nerve in 55/104, 4/104 and 45/104. Most (102/104) had primary position horizontal nystagmus; none had gaze-evoked nystagmus. Two inferior VN patients had contraversive torsional-downbeat nystagmus. Horizontal nystagmus with SPV ≥ 5.8 °/s separated AVN from PCS with sensitivity and specificity of 91.2% and 83.0%. Absent nystagmus, gaze-evoked nystagmus, and vertical-torsional nystagmus were highly specific for PCS (100%, 100% and 98.1%).

Conclusion: Nystagmus is often absent in PCS and always present in AVN. Unidirectional 'peripheral-appearing' horizontal nystagmus can be seen in PCS. ER-based VNG nystagmus assessment could provide useful diagnostic information when separating PCS from AVN.

Keywords: Emergency medicine; Nystagmus; Stroke; Vertigo; Vestibular neuritis.

PMID: 35849153



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September 21, 2022

Shah VP, Oliveira J E Silva L, Farah W, et al. **Diagnostic accuracy of neuroimaging in emergency department patients with acute vertigo or dizziness: A systematic review and meta-analysis for the guidelines for reasonable and appropriate care in the emergency department** [published online ahead of print, 2022 Jul 25]. *Acad Emerg Med.* 2022;10.1111/acem.14561. doi:10.1111/acem.14561

Background: Patients presenting to the emergency department (ED) with acute vertigo or dizziness represent a diagnostic challenge. Neuroimaging has variable indications and yield. We aimed to conduct a systematic review and meta-analysis of the diagnostic test accuracy of neuroimaging for patients presenting with acute vertigo or dizziness.

Methods: An electronic search was designed following patient-intervention-control-outcome (PICO) question-(P) adult patients with acute vertigo or dizziness presenting to the ED; (I) neuroimaging including computed tomography (CT), CT angiography (CTA), magnetic resonance imaging (MRI), magnetic resonance angiography (MRA), and ultrasound (US); (C) MRI/clinical criterion standard; and (O) central causes (stroke, hemorrhage, tumor, others) versus peripheral causes of symptoms. Articles were assessed in duplicate. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed. Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) was used to assess certainty of evidence in pooled estimates.

Results: We included studies that reported diagnostic test accuracy. From 6309 titles, 460 articles were retrieved, and 12 were included: noncontrast CT scan-six studies, 771 patients, pooled sensitivity 28.5% (95% confidence interval [CI] 14.4%-48.5%, moderate certainty) and specificity 98.9% (95% CI 93.4%-99.8%, moderate certainty); MRI-five studies, 943 patients, sensitivity 79.8% (95% CI 71.4%-86.2%, high certainty) and specificity 98.8% (95% CI 96.2%-100%, high certainty); CTA-one study, 153 patients, sensitivity 14.3% (95% CI 1.8%-42.8%) and specificity 97.7% (95% CI 93.8%-99.6%), CT had higher sensitivity than CTA (21.4% and 14.3%) for central etiology; MRA-one study, 24 patients, sensitivity 60.0% (95% CI 26.2%-87.8%) and specificity 92.9% (95% CI 66.1%-99.8%); US-three studies, 258 patients, sensitivity ranged from 30% to 53.6%, specificity from 94.9% to 100%.

Conclusions: Noncontrast CT has very low sensitivity and MRI will miss approximately one in five patients with stroke if imaging is obtained early after symptom onset. The evidence does not support neuroimaging as the only tool for ruling out stroke and other central causes in patients with acute dizziness or vertigo presenting to the ED.

PMID: 35876220

September 28, 2022



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Pellegrino N, Di Stefano V, Rotondo E, et al. **Neurological vertigo in the emergency room in pediatric and adult age: systematic literature review and proposal for a diagnostic algorithm.** Ital J Pediatr. 2022;48(1):125. Published 2022 Jul 27. doi:10.1186/s13052-022-01313-7

Neurological vertigo is a common symptom in children and adults presenting to the emergency department (ED) and its evaluation may be challenging, requiring often the intervention of different medical specialties. When vertigo is associated with other specific symptoms or signs, a differential diagnosis may be easier. Conversely, if the patient exhibits isolated vertigo, the diagnostic approach becomes complex and only through a detailed history, a complete physical examination and specific tests the clinician can reach the correct diagnosis. Approach to vertigo in ED is considerably different in children and adults due to the differences in incidence and prevalence of the various causes. The aim of this systematic review is to describe the etiopathologies of neurological vertigo in childhood and adulthood, highlighting the characteristics and the investigations that may lead clinicians to a proper diagnosis. Finally, this review aims to develop an algorithm that could represent a valid diagnostic support for emergency physicians in approaching patients with isolated vertigo, both in pediatric and adult age.

Keywords: Adulthood; Childhood; Emergency department; Vertigo.

PMID: 35897016

October Topic: Rehabilitation Implications of Vestibular Surgical Interventions

October 05, 2022

Chow MR, Ayiotis AI, Schoo DP, Gimmon Y, Lane KE, Morris BJ, Rahman MA, Valentin NS, Boutros PJ, Bowditch SP, Ward BK, Sun DQ, Treviño Guajardo C, Schubert MC, Carey JP, Della Santina CC. **Posture, Gait, Quality of Life, and Hearing with a Vestibular Implant.** N Engl J Med. 2021 Feb 11;384(6):521-532. doi: 10.1056/NEJMoa2020457. PMID: 33567192; PMCID: PMC8477665.

BACKGROUND

Bilateral vestibular hypofunction is associated with chronic disequilibrium, postural instability, and unsteady gait owing to failure of vestibular reflexes that stabilize the eyes, head, and body. A vestibular implant may be effective in alleviating symptoms.

METHODS

Persons who had had ototoxic (7 participants) or idiopathic (1 participant) bilateral vestibular hypofunction for 2 to 23 years underwent unilateral implantation of a prosthesis that electrically



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stimulates the three semicircular canal branches of the vestibular nerve. Clinical outcomes included the score on the Bruininks–Oseretsky Test of Motor Proficiency balance subtest (range, 0 to 36, with higher scores indicating better balance), time to failure on the modified Romberg test (range, 0 to 30 seconds), score on the Dynamic Gait Index (range, 0 to 24, with higher scores indicating better gait performance), time needed to complete the Timed Up and Go test, gait speed, pure-tone auditory detection thresholds, speech discrimination scores, and quality of life. We compared participants' results at baseline (before implantation) with those at 6 months (8 participants) and at 1 year (6 participants) with the device set in its usual treatment mode (varying stimulus pulse rate and amplitude to represent rotational head motion) and in a placebo mode (holding pulse rate and amplitude constant).

RESULTS

The median scores at baseline and at 6 months on the Bruininks–Oseretsky test were 17.5 and 21.0, respectively (median within-participant difference, 5.5 points; 95% confidence interval [CI], 0 to 10.0); the median times on the modified Romberg test were 3.6 seconds and 8.3 seconds (difference, 5.1; 95% CI, 1.5 to 27.6); the median scores on the Dynamic Gait Index were 12.5 and 22.5 (difference, 10.5 points; 95% CI, 1.5 to 12.0); the median times on the Timed Up and Go test were 11.0 seconds and 8.7 seconds (difference, 2.3; 95% CI, -1.7 to 5.0); and the median speeds on the gait-speed test were 1.03 m per second and 1.10 m per second (difference, 0.13; 95% CI, -0.25 to 0.30). Placebo-mode testing confirmed that improvements were due to treatment-mode stimulation. Among the 6 participants who were also assessed at 1 year, the median within-participant changes from baseline to 1 year were generally consistent with results at 6 months. Implantation caused ipsilateral hearing loss, with the air-conducted pure-tone average detection threshold at 6 months increasing by 3 to 16 dB in 5 participants and by 74 to 104 dB in 3 participants. Changes in participant-reported disability and quality of life paralleled changes in posture and gait.

CONCLUSIONS

Six months and 1 year after unilateral implantation of a vestibular prosthesis for bilateral vestibular hypofunction, measures of posture, gait, and quality of life were generally in the direction of improvement from baseline, but hearing was reduced in the ear with the implant in all but 1 participant. (Funded by the National Institutes of Health and others; ClinicalTrials.gov number, NCT02725463.)

PMID: 33567192

October 13, 2022

Vaz FC, Petrus L, Martins WR, et al. **The effect of cochlear implant surgery on vestibular function in adults: A meta-analysis study.** *Front Neurol.* 2022;13:947589. Published 2022 Aug 10.
doi:10.3389/fneur.2022.947589

Issue: The findings in literature indicate inconsistency in the complications caused by the implant of electrodes in the cochlea; vestibular alterations and balance disorders are mentioned as the most likely.



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Purpose: To evaluate, in literature, through the results of multiple vestibular function tests, the effects of cochlear implant surgery on postural stability in adult patients and to analyze.

Hypothesis: From the PICO strategy, where the Population focuses on adults, Intervention is cochlear implant surgery, Comparisons are between implanted patients, and Outcomes are the results of the assessment of cochlear function, the research question was formulated: Are there deficits in vestibular function in adults undergoing cochlear implant placement?

Method: Systematic review based on cohort, case-control, and cross-sectional observational studies. Information sources: Databases between 1980 and 2021, namely, PubMed, Cinahl, Web Of Science, Cochrane, and Scopus. Search strategy using Mesh terms: "Adult," "Cochlear Implant," "Postural Balance," "Posturography," "Cochlear Implant," "Dizziness," "Vertigo," "Vestibular Functional Tests," and "Caloric Tests." Populational inclusion criteria: studies with adult patients; intervention: cochlear implant placement surgery; comparison: analysis of a vestibular function with vestibular test results and pre- and postoperative symptoms; outcome: studies with at least one of the vestibular function tests, such as computerized vectoelectronystagmography (VENG), vestibular-evoked myogenic potentials (VEMPs), caloric test, video head impulse test (VHIT), head impulse test (HIT), videonystagmography, (VNG) and static and dynamic posturography. Exclusion criteria: studies without records of pre- and postoperative data collection and studies with populations under 18 years of age. Screening based on the reading of abstracts and titles was performed independently by two reviewers. In the end, with the intermediation of a third reviewer, manuscripts were included. Risk of bias analysis, performed by two other authors, occurred using the JBI "Critical Appraisal Checklist."

Results: Of the 757 studies, 38 articles met the inclusion criteria. VEMP was the most commonly used test by the studies (44.7%), followed by the caloric test (36.8%) and vHIT (23.6%). Most studies performed more than one test to assess vestibular function.

Conclusion: Among all vestibular tests investigated, the deleterious effects on vestibular function after cochlear implant surgery were detected with statistical significance ($P < 0.05$) using VEMP and caloric test. Comparing abnormal and normal results after implant surgery, the vestibular apparatus was evaluated as having abnormal results after cochlear implant surgery only in the VEMP test. The other tests analyzed maintained a percentage mostly considered normal results.

Keywords: balance; cochlear implant; dizziness; vertigo; vestibular function; vestibular loss.

PMID: 36034277

October 21, 2022



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Zobeiri, O. A., Mischler, G. M., King, S. A., Lewis, R. F., Cullen, K. E. (2021). **Effects of vestibular neurectomy and neural compensation on head movements in patients undergoing vestibular schwannoma resection.** *Scientific reports*, 11(1), 1-14.

Background: The vestibular system is vital for maintaining balance and stabilizing gaze and vestibular damage causes impaired postural and gaze control. This article examined the effects of vestibular loss and subsequent compensation on head motion kinematics during voluntary behavior in patients with vestibular neurectomies.

Methods: Head movements were measured in vestibular schwannoma patients before, and then 6 weeks and 6 months after surgical tumor removal, requiring sectioning of the involved vestibular nerve (vestibular neurectomy). Head movements were recorded in six dimensions using a small head-mounted sensor while patients performed the Functional Gait Assessment (FGA).

Results: Kinematic measures differed between patients (at all three time points) and normal subjects on several challenging FGA tasks, indicating that vestibular damage (caused by the tumor or neurectomy) alters head movements in a manner that is not normalized by central compensation. Kinematics measured at different time points relative to vestibular neurectomy differed substantially between pre-operative and 6-week post-operative states but changed little between 6-week and > 6-month post-operative states, demonstrating that compensation affecting head kinematics is relatively rapid.

Conclusion: Quantifying head kinematics during self-generated gait tasks provides valuable information about vestibular damage and compensation, suggesting that early changes in patient head motion strategy may be maladaptive for long-term vestibular compensation.

PMID: 7804855

November Topic: Vestibular Disorders

November 09, 2022

Jeong J. **Vestibular neuritis after COVID-19 vaccination.** *Hum Vaccin Immunother.* 2021;17(12):5126-5128. doi:10.1080/21645515.2021.2013085

Coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 and presents with pneumonia as the most frequent and serious manifestation. COVID-19 vaccination is an important and urgent interest globally due to COVID-19's rapid spread and high rates of mortality and morbidity. Vestibular neuritis (VN) is an acute vestibular syndrome that causes acute and spontaneous vertigo due to unilateral vestibular deafferentiation, leading to nausea or vomiting and unsteadiness that can last from days to weeks. Reactivation of latent type 1 herpes simplex virus, autoimmune



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disorders, and microvascular ischemia are hypothesized to be etiologies. Herein, the case of a 54-year-old man who developed VN within three days after COVID-19 vaccination is presented. There have been no reports of VN after vaccination for COVID-19 or other viral diseases. Although the association between VN and COVID-19 vaccination remains unclear, clinicians should be aware that VN may occur as an adverse event of COVID-19 vaccination.

Keywords: COVID-19; COVID-19 vaccine; SARS-CoV-2; Vestibular neuritis; vaccination; vaccine.

PMID: 34898387

November 16, 2022

Bauwens A, Larock F. **Vestibular asthenopia**. *J Fr Ophtalmol*. 2021;44(10):1560-1565.

doi:10.1016/j.jfo.2021.05.008

Vestibular asthenopia, analogous to visual asthenopia, is a sensory (or sensory-motor) discomfort consisting of a set of subjective symptoms, the expression of which is essentially visual and whose origin is a transient vestibular incident. It can be considered the result of a sudden global central disorder, such as a "computer glitch," following a chain of events in response to an initial vestibular disease, even minor and devoid of clinical signs. This disorder results in inadequate processing and imperfect integration of afferent visual and vestibular input, leading to ocular fatigue, pain associated with eye movement, and sensitivity to retinal slip.

Keywords: Asthénopie vestibulaire; Deficit vestibulaire; Dizziness; Peripheral retina; Rehabilitation vestibulo-visuelle; Rétine périphérique; Vestibular asthenopia; Vestibular deficit; Vestibulo-visual rehabilitation.

PMID: 34556339

November 23, 2022

Beh SC. **Vestibular Migraine**. *Curr Neurol Neurosci Rep*. 2022;22(10):601-609. doi:10.1007/s11910-022-01222-6

Purpose of review: To explore recent developments in vestibular migraine (VM).

Recent findings: This review discusses the current diagnostic criteria for VM in the adult and pediatric populations, as proposed by the International Headache Society and Bárány Society. Recent VM studies confirm the prior findings and reveal new insights, including the wide range of vestibular symptoms, symptoms in the attack-free period, and triggers. Many patients experience persistent vestibular symptoms, even in the absence of acute attacks, which often significantly impact patients' quality of life. The syndrome of benign recurrent vertigo and its relationship to migraine, VM, and Meniere's disease is also discussed. There is a dearth of randomized controlled trials in VM



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treatment. Prospective and retrospective studies support the benefit of many migraine treatments are effective in VM, including neuromodulation, and calcitonin gene-related peptide monoclonal antibodies. VM affects almost 3% of the population, but remains under-diagnosed. Recent diagnostic criteria can help clinicians diagnose VM in adults and children.

Keywords: Dizziness; Migraine; Vertigo; Vestibular migraine.

PMID: 36044103

November 30, 2022

Bae CH, Na HG, Choi YS. **Current diagnosis and treatment of vestibular neuritis: a narrative review.** *J Yeungnam Med Sci.* 2022;39(2):81-88. doi:10.12701/yujm.2021.01228

Vertigo is the sensation of self-motion of the head or body when no self-motion is occurring or the sensation of distorted self-motion during an otherwise normal head movement. Representative peripheral vertigo disorders include benign paroxysmal positional vertigo, Ménière disease, and vestibular neuritis. Vestibular neuritis, also known as vestibular neuronitis, is the third most common peripheral vestibular disorder after benign paroxysmal positional vertigo and Ménière disease. The cause of vestibular neuritis remains unclear. However, a viral infection of the vestibular nerve or ischemia of the anterior vestibular artery is known to cause vestibular neuritis. In addition, recent studies on immune-mediated mechanisms as the cause of vestibular neuritis have been reported. The characteristic clinical features of vestibular neuritis are abrupt true-whirling vertigo lasting for more than 24 hours, and no presence of cochlear symptoms and other neurological symptoms and signs. To accurately diagnose vestibular neuritis, various diagnostic tests such as the head impulse test, bithermal caloric test, and vestibular-evoked myogenic potential test are conducted. Various treatments for vestibular neuritis have been reported, which are largely divided into symptomatic therapy, specific drug therapy, and vestibular rehabilitation therapy. Symptomatic therapies include generalized supportive care and administration of vestibular suppressants and antiemetics. Specific drug therapies include steroid therapy, antiviral therapy, and vasodilator therapy. Vestibular rehabilitation therapies include generalized vestibular and customized vestibular exercises.

Keywords: Diagnosis; Treatment; Vertigo; Vestibular neuritis.

PMID: 34411472

December Topic: Red Flags

December 16, 2022



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Cacho-Díaz, B., Salmerón-Moreno, K., Mendoza-Olivas, L. G., Reynoso-Noverón, N., & Gómez-Amador, J. L. (2019). **Vertigo in patients with cancer: Red flag symptoms**. *Journal of clinical neuroscience: official journal of the Neurosurgical Society of Australasia*, 69, 175–178.
<https://doi.org/10.1016/j.jocn.2019.07.071>

Introduction: Vertigo is a common condition occurring in the general population and is usually self-limited. Reports studying vertigo in patients with brain metastasis (BM), are scarce. Therefore, the aim of this study was to analyze if the presence of vertigo in cancer patients is associated with the presence of BM.

Methods: This study was conducted in a cancer referral center, where patients with confirmed systemic cancer sent for a neuro-oncologic consultation from May 2012 to March 2018 were included for review.

Results: Of 3220 patients, 723 were diagnosed with BM, and 204 had vertigo. Of these patients, 22.5% of those who had vertigo were diagnosed to have BM and 6% of those with BM had vertigo as an initial symptom (odds ratio [OR] 0.9; $p = 0.9$). An additional symptom was present in 104 patients with vertigo. Bivariate regression analysis disclosed a higher risk of having BM in patients with vertigo accompanied by headache (OR18.6; $p < 0.0001$), ataxia (OR12.1; $p < 0.0001$), seizures (OR10.9; $p = 0.04$), visual symptoms (OR10.4; $p < 0.0001$), speech impairment (OR6.3; $p = 0.01$), altered mental status (OR7.4; $p < 0.0001$), and focal weakness (OR7.4; $p = 0.001$), or focal sensitive complaint (OR6.9; $p = 0.003$). Vertigo with headache or ataxia remained statistically significant after multivariate analysis.

Conclusion: In this cohort, a higher risk of having BM was associated with the presence of vertigo coexistent with headache, ataxia, seizures, visual symptoms, speech impairment, altered mental status, focal weakness, or focal sensitive complaint. On the basis of these results, these accompanying symptoms must be considered as red flags in patients with systemic cancer.

PMID: 31409547

December 16, 2022

Długaiczek J. (2021). **Rare Disorders of the Vestibular Labyrinth: of Zebras, Chameleons and Wolves in Sheep's Clothing**. *Seltene Erkrankungen des vestibulären Labyrinths: von Zebras, Chamäleons und Wölfen im Schafspelz*. *Laryngo- rhino- otologie*, 100(S 01), S1–S40. <https://doi.org/10.1055/a-1349-7475>

The differential diagnosis of vertigo syndromes is a challenging issue, as many - and in particular - rare disorders of the vestibular labyrinth can hide behind the very common symptoms of "vertigo" and "dizziness". The following article presents an overview of those rare disorders of the balance organ that are of special interest for the otorhinolaryngologist dealing with vertigo disorders. For a better orientation, these disorders are categorized as acute (AVS), episodic (EVS) and chronic vestibular syndromes (CVS) according to their clinical presentation. The main focus lies on EVS sorted by their



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duration and the presence/absence of triggering factors (seconds, no triggers: vestibular paroxysmia, Tumarkin attacks; seconds, sound and pressure induced: "third window" syndromes; seconds to minutes, positional: rare variants and differential diagnoses of benign paroxysmal positional vertigo; hours to days, spontaneous: intralabyrinthine schwannomas, endolymphatic sac tumors, autoimmune disorders of the inner ear). Furthermore, rare causes of AVS (inferior vestibular neuritis, otolith organ specific dysfunction, vascular labyrinthine disorders, acute bilateral vestibulopathy) and CVS (chronic bilateral vestibulopathy) are covered. In each case, special emphasis is laid on the decisive diagnostic test for the identification of the rare disease and "red flags" for potentially dangerous disorders (e. g. labyrinthine infarction/hemorrhage). Thus, this chapter may serve as a clinical companion for the otorhinolaryngologist aiding in the efficient diagnosis and treatment of rare disorders of the vestibular labyrinth.

PMID: 34352900

December 21, 2022

Garone, G., Suppiej, A., Vanacore, N., La Penna, F., Parisi, P., Calistri, L., Palmieri, A., Verrotti, A., Poletto, E., Rossetti, A., Cordelli, D. M., Velardita, M., d'Alonzo, R., De Liso, P., Gioè, D., Marin, M., Zagaroli, L., Grosso, S., Bonfatti, R., Mencaroni, E., ... Raucci, U. (2020). **Characteristics of Acute Nystagmus in the Pediatric Emergency Department.** *Pediatrics*, 146(2), e20200484. <https://doi.org/10.1542/peds.2020-0484>

Objectives: Acute nystagmus (AN) is an uncommon neurologic sign in children presenting to pediatric emergency departments. We described the epidemiology, clinical features, and underlying causes of AN in a large cohort of children, aiming at identifying features associated with higher risk of severe underlying urgent conditions (UCs).

Methods: Clinical records of all patients aged 0 to 18 years presenting for AN to the pediatric emergency departments of 9 Italian hospitals in an 8-year period were retrospectively reviewed. Clinical and demographic features and the underlying causes were analyzed. A logistic regression model was applied to detect predictive variables associated with a higher risk of UCs.

Results: A total of 206 patients with AN were included (male-to-female ratio: 1.01; mean age: 8 years 11 months). The most frequently associated symptoms were headache (43.2%) and vertigo (42.2%). Ataxia (17.5%) and strabismus (13.1%) were the most common neurologic signs. Migraine (25.7%) and vestibular disorders (14.1%) were the most common causes of AN. Idiopathic infantile nystagmus was the most common cause in infants <1 year of age. UCs accounted for 18.9% of all cases, mostly represented by brain tumors (8.3%). Accordant with the logistic model, cranial nerve deficits, ataxia, or strabismus were strongly associated with an underlying UC. Presence of vertigo or attribution of a nonurgent triage code was associated with a reduced risk of UCs.



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Conclusions: AN should be considered an alarming finding in children given the risk of severe UCs. Cranial nerve palsy, ataxia, and strabismus should be considered red flags during the assessment of a child with AN.

PMID: 32732262

December 28, 2022

Joshi, P., Mossman, S., Luis, L., & Luxon, L. M. (2020). **Central mimics of benign paroxysmal positional vertigo: an illustrative case series.** *Neurological sciences: official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology*, 41(2), 263–269.

<https://doi.org/10.1007/s10072-019-04101-0>

Benign paroxysmal positional vertigo (BPPV) is the most common peripheral vestibular disorder that is diagnosed based solely on clinical findings. Rarely, central lesions can present with positional vertigo and nystagmus, mimicking BPPV. Recognised red flags that may help distinguish central mimics from BPPV include the presence of additional neurological symptoms and signs, atypical nystagmus patterns, and the absence of a sustained response to repositioning manoeuvres. We present seven cases that illustrate how heuristic bias may affect the detection of these features in practice. Furthermore, our cases suggest that isolated downbeat positional nystagmus (simulating anterior canal BPPV) and apogeotropic horizontal nystagmus on the supine roll test (simulating horizontal canal BPPV) should be considered additional red flags.

Keywords: Clinical neurology; Nystagmus; Vertigo.

PMID: 31691861