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Review

Assessment of Visual Complaints in Patients with Chronic Migraine Syndromes

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Abstract

Migraine refers to a unilateral severe throbbing headache that is accompanied by nausea, vomiting, photophobia, and sonophobia. It affects about 14% of the global population, leading to significant disability and lower quality of life. Chronic migraine is characterized by having 15 headache days or more per month, with chronic migraineurs experiencing greater disease burden, worse socio-economic functioning, and worse visual quality of life. These disabilities are attributed to the higher cortical hyperexcitability in chronic migraine patients compared with episodic migraineurs. Among the experienced visual complaints, visual aura, visual snow, and transient visual loss are among the most frequently reported complaints, with the aura being the most common visual symptom among chronic migraineurs. Clinical assessment of visual complaints in chronic migraine patients is considered challenging, as chronic migraineurs often report atypical or prolonged visual symptoms that cause diagnostic ambiguity, requiring differential diagnosis and accurate assessment of the visual symptoms to rule out serious secondary causes and avoid poor patient outcomes. This narrative review aims to explore current evidence regarding visual complaints among chronic migraineurs, in addition to clinical assessment of these complaints and differential diagnosis of migraine-associated visual symptoms.

Keywords: *chronic migraine, visual complaints, visual aura, visual snow, clinical assessment, differential diagnosis*

Introduction

Migraine is defined as a unilateral severe throbbing headache, accompanied by nausea, vomiting, photophobia, and sonophobia (1). It is considered one of the most disabling neurological disorders worldwide, affecting about 14% of the global population with a higher prevalence among women, leading to a significant lowering of quality of life (2). It is further classified according to the presence of aura into migraine with aura and migraine without aura. It can also be classified based on the number of headache days into episodic migraine and chronic migraine. Chronic migraine is characterized by having 15 headache days or more per month, while episodic migraine is characterized by having 14 headache days or less per month (3).

Chronic migraine usually develops from episodic migraine that gradually increases in attack frequency, which supports the view of migraine as a spectrum disorder (4). Compared with episodic migraineurs, chronic migraine patients experience greater headache-related burden and worse socio-economic functioning. Chronic migraine patients also are twice as likely to experience comorbid conditions such as anxiety and depression (5). Moreover, patients with chronic migraine have decreased visual quality of life compared to episodic migraineurs. In fact, their visual quality of life is considered as poor as those of patients with other neuro-ophthalmic disorders such as multiple sclerosis and ischemic optic neuropathy (6).

Visual disturbances are common among migraine patients such as visual aura, visual snow, photophobia, and transient visual loss. These symptoms are attributed to cortical hyperexcitability as detected by magnetic resonance imaging (MRI). In migraine-related visual aura, a process known as cortical spreading depression (CSD) is responsible for the associated visual symptoms. It involves cortical hyperexcitability followed by hypometabolism or hypoperfusion that spreads along the occipital cortex (7). Chronic migraine patients exhibit greater cortical hyperexcitability than episodic migraineurs. Moreover, chronic migraineurs also exhibit persistent cortical hyperexcitability between migraine attacks, in contrast with episodic migraineurs who show intermittent cortical hyperexcitability, which explains the burden and severity of migraine in chronic migraine patients (8, 9).

Clinical assessment of visual symptoms in migraine patients involves detailed patient history-taking to determine the characteristics of the visual complaint, including its nature, onset, progression, and duration. Clinical assessment also involves normal ophthalmology tests such as corrected visual acuity, fundus examination, visual field test, optical coherence tomography (OCT), Visual evoked potentials (VEP), and electroretinography (ERG) (10-14). In some cases, electroencephalography (EEG) and cranial magnetic resonance imaging (cMRI) are required to rule out other serious secondary causes such as ischemia. However, chronic migraine patients often report atypical or prolonged visual symptoms that cause diagnostic ambiguity, requiring differential diagnosis and accurate assessment of the visual symptoms to avoid poor patient outcomes (15). This narrative review aims to summarize current knowledge regarding visual complaints among chronic migraineurs, in addition to clinical assessment of these complaints and differential diagnosis of migraine-associated visual symptoms.

Methodology

This narrative review is based on an extensive literature search conducted on 27 November 2025 in PubMed, Cochrane, Scopus, and Web of Science databases using medical subject headings (MeSH) and relevant keywords. The search aimed to identify studies investigating the assessment of visual complaints in chronic migraine patients. The review focused on articles that investigate visual symptoms reported in patients with chronic migraine, in addition to their clinical evaluation and differentiating between migraine-related visual phenomena and serious secondary causes. No restrictions were applied regarding publication date, language, or type of publication to ensure a broad and inclusive investigation of the available literature.

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Discussion

Visual complaints in chronic migraine patients

Approximately one third of migraine patients experience migraine with aura, with visual aura occurring in more than 90% of migraine with aura patients (1, 16). Visual aura is considered the most frequent visual symptom among chronic migraineurs. Typical visual aura presents with scintillating scotoma (flickering blind spots) or fortification spectrum (zigzag and diamond figures) that gradually extend to the peripheral visual field (15). Symptoms of visual aura often last for 5 to 60 minutes, and they usually occur before or during the headache phase of a migraine attack (16).

Scintillating scotoma refers to a blind spot or partial loss of vision accompanied by flashes, flickering, or shimmering lights that often appear as zigzag lines. Due to their characteristic flickering or zigzag patterns, scintillating scotomas are often categorized as a positive phenomenon. Fortification spectrum, also known as teichopsia, is described as a complex zigzagging pattern and flickering lines, which are typically irrespective of color, but they can occasionally present as color dense. These lines usually begin close to the center of visual field, followed by a gradual outward extension. Like scintillating scotoma, fortification spectrum is categorized as a positive phenomenon (17).

Other simpler patterns of visual aura that may occur alone or in combination include flashes of bright light, phosphenes (small bright dots), focal visual field defects (localized blind spots), hemianopia (losing sight in half of the visual field), and visual blurring. Visual aura usually presents with more than one of these symptoms, with blurred vision and bright flashes of light being the most occurring visual patterns. Visual aura may be always bilateral (36%), always at the same side of the visual field (33%), differ from side to side (26%), or sometimes unilateral and bilateral (5%) (18).

Persistent visual aura without infarction is considered a rare complication of migraine, and it refers to the condition of visual aura symptoms persisting for one week or more without evidence of infarction on neuroimaging. Although this condition is considered rare, it is well-documented and has been reported in several chronic migraine patients. Unfortunately, due to its rare occurrence, it may be confused with other visual complaints of migraine (16).

Another visual symptom that is strongly associated with chronic migraine is the visual snow syndrome. Patients often describe visual snow as small dots in the entire visual field that resemble television static (16). The presentation of visual snow symptoms differs greatly from migraine-related visual aura regarding duration, consistency, and location of symptoms within the visual fields (19). Visual snow is often associated with other visual disturbances such as palinopsia (trailing and after images), bright flashes of light, photophobia (light sensitivity in which normal light is perceived as either too bright or painful), and nyctalopia (impaired night vision) (20). Visual snow should not be misinterpreted as migraine-related visual aura or persistent visual aura (16).

Transient visual loss is a common negative visual phenomenon among migraine with aura patients. Migraine-associated transient vision loss starts gradually over several minutes, lasting from 30 minutes to several hours. Migraine-related vision loss can be followed by headache or may occur without headache (21).

Clinical assessment of visual symptoms in migraine patients

Clinical assessment of migraine-related visual symptoms involves patient history, ophthalmology testing, and neuroimaging. Detailed patient history is required to determine the specifics of the visual symptom, including its nature, onset, progression, and duration, in addition to using structured headache and aura diaries to better understand the frequency, pattern, and triggers of aura episodes (16, 22). The most helpful questions that a clinician should ask for history-taking are whether the visual symptoms are present in one eye or in both, whether the onset of symptoms was sudden or over minutes or days, and whether the symptoms have occurred

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only once or frequently or continuously persistent (15).

Normal ophthalmology tests are used for assessment of visual symptoms among migraine patients. These tests include corrected visual acuity, fundoscopy, visual field examination, optical coherence tomography, visual evoked potentials, and electroretinography. Detailed ophthalmological examination that includes corrected visual acuity and fundus examination is required for determination of refractive errors in migraine patients (10). Visual field losses are mainly detected through visual field testing. Temporal modulation perimetry is a specific type of visual field examination that measures flicker sensitivity across the visual field, and it has been used to identify field losses in migraine patients and detect alterations in temporal processing among migraineurs (11).

To detect retinal changes, OCT is used. It is a technique that utilizes infrared wavelengths for measurement of thinning of the retinal nerve fiber layer (12). OCT has been used to detect constriction of the retinal and ciliary arteries, which may contribute to ischemic damage to the optic nerve, retina, and choroid in migraine patients (23). Moreover, chronic migraine patients have been shown to have decreased retinal thickness, as detected via OCT (24). VEP are obtained by recording the induced electroencephalographic activity in the visual cortex in response to repeated visual stimuli, and it is considered a reliable measure for cerebral responsiveness to visual stimuli. VEP amplitude has been found to be higher in migraine patients, indicating visual hyper-responsiveness (13). ERG is used to detect electrophysiological deficits and retinal dysfunction in migraine patients. Abnormally reduced ERG responses have been reported in migraine patients with no visual field loss and asymptomatic in between migraine attacks, suggesting a possible retinal locus of neuronal dysfunction in migraineurs (14).

Neuroimaging is considered necessary when the neurological deficit presentation is atypical. Red flags include new-onset symptoms, persistent symptoms for more than one hour, symptoms affecting one eye only, onset at an older age, and additional ocular or neurologic deficits. Neuroimaging techniques include MRI and EEG. MRI and EEG are used to capture features of CSD, which is responsible for the visual symptoms of migraine aura (25). Moreover, EEG is used to distinguish between migraine aura and visual epilepsy aura, while MRI is used for detection of ischemia (15).

Differential diagnosis of migraine-associated visual symptoms

Visual aura is characterized by transient visual disturbances that cause diagnostic ambiguity due to their overlapping with other neuro-ophthalmic conditions, namely transient ischemic attack (TIA) and epilepsy aura. Therefore, accurate diagnosis of migraine-related visual aura from other conditions that cause transient visual disturbances is considered critical. The diagnostic approach to migraine-related visual aura comprises a multifaceted assessment that includes clinical evaluation, neuroimaging techniques, and differential diagnosis (17). The principal difference between migraine-related visual aura and TIA is that TIA involves acute onset of several negative symptoms in a simultaneous manner, and the patient is usually elderly (above 50 years) (26), while in epilepsy aura the main distinguishing characteristic from migraine-related visual aura is how long the phenomenon lasted. Epilepsy aura presents with acute onset of symptoms with a duration below 5 minutes. Duration of more than 5 minutes indicated migraine-related visual aura. Moreover, epilepsy patients rarely report photophobia, sonophobia, or occurrence of nausea or vomiting (27).

As for visual snow, although it is often benign, some serious conditions may have an initial presentation of visual snow, and they should be excluded to avoid serious ocular damage or even death. There are four main categories of pathologies that mimic visual snow, including neurological disorders, ocular pathologies, drug-related visual snow, and other systemic diseases. Red flags when evaluating possible visual snow include new-onset visual snow, intermittent or sudden exacerbation of visual

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snow, unilateral or hemifield visual snow, onset at an older age, history of recently discontinued illicit drugs, and additional ocular or neurologic deficits (28).

Neurological disorders that affect the occipital visual area may induce visual snow, such as stroke, epilepsy, multiple sclerosis, neoplastic diseases, and degenerative diseases. Ocular pathologies that may present with visual snow include macular atrophy (Charles Bonnet syndrome), central serous retinopathy, vitreous detachment, and optic atrophy. Drug-related visual snow includes hallucinogen persisting perception disorder (HPPD), in addition to the effects of other medications such as proton pump inhibitor, imiquimod, ciprofloxacin, tamoxifen, amantadine, testosterone, citalopram, duloxetine, and bupropion as well as intravenous steroids (29).

Furthermore, visual snow may be misdiagnosed as migraine-related visual aura. However, there are several distinctions between migraine aura and visual snow syndrome. Visual snow affects the whole visual field, and it lacks typical features of migraine aura such as scintillating scotomas and fortification spectra. It is considered a persistent visual phenomenon and does not fluctuate with migraine cycle. Moreover, visual snow syndrome shows no evidence of cortical spreading depression and does not respond to antimigraine drugs. In fact, recent studies support the view of visual snow as a separate condition that often co-exist with migraine as a comorbidity, and may be present alone (16, 20, 30).

For differential diagnosis of visual snow, standard history, neurologic examination, and neuroimaging using magnetic resonance imaging and EEG can exclude secondary visual snow due to neurological disorders. While ocular pathologies can be ruled out through ophthalmologic examination, including visual field testing, fundus examination, OCT, and ERG. To identify drug-related visual snow, detailed and accurate patient history in addition to causality assessment tools for adverse drug reaction are important to recognize HPPD and medication-induced visual snow (20, 28, 31).

Transient vision loss has various causes that can be benign such as migraines or life-threatening such as carotid artery disease or thromboembolism (32). Transient vision loss also manifests as a visual symptom in migraine with aura, and it presents with binocular or homonymous auras that arise from cortical hyperexcitability in migraineurs (33). Transient monocular total vision loss or monocular field defects that are fully reversible and followed by a migraine headache is a condition known as retinal migraine, potentially linked to retinal ischemia (34). Overlaps between transient vision loss presentations in retinal migraine and migraine with aura cause diagnostic ambiguity. These diagnostic overlaps comprise transient phenomena that are less than one hour, in addition to gradual spread. Main distinctions between the two conditions are laterality, symptom type, as well as duration variability. Detailed and accurate history-taking that emphasizes monocularity of the symptoms in addition to ruling out vascular pathologies such as retinal hemorrhage, arterial occlusion, and transient ischemia, are critical for proper diagnosis of retinal migraine and avoiding poor outcomes such as permanent vision loss (33).

Future directions

Wearable devices driven by artificial intelligence (AI) offer new opportunities for diagnosis and monitoring of migraine attacks. Implementation of AI allows for vast data processing for identification of patterns and symptom prediction to provide personalized interventions. These wearable sensors offer real-time measurements for metabolic and hormonal activity, providing a better understanding of migraine-associated physiological changes. Such devices include smartwatches and EEG-integrated headbands that can record biometric data related to migraine pathophysiology (35). Moreover, the use of electronic migraine diaries is facilitated through specialized mobile applications. Migraine Buddy is a widely used headache application that offers a convenient and effective way for patients to track details of their headache or migraine attacks, including type, symptoms, duration, triggers, severity, frequency, and medication use, and attack severity in real time (36). These electronic diaries

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have several advantages over traditional paper-based headache diaries, including reducing the burden of manual record-keeping, along with minimizing the risk of recall bias, which leads to better and personalized management (37).

Advancements in migraine diagnostics involve the use of supervised machine learning approaches for identifying chronic migraine based on its characteristic alterations in sensory processing (38). These alterations in sensory processing include decreased activation in brainstem and cortical regions, along with increased brainstem-to-cortex effective connectivity. Moreover, enhanced brainstem-to-cortex connectivity is considered an indicator of progression of episodic migraine into chronic migraine. A study investigated combining EEG with machine learning algorithms, in which classification models were used to identify electrophysiological and psychometric features associated with headache frequency. Results showed that these models could differentiate between migraineurs and healthy controls, in addition to distinguishing between chronic migraineurs and episodic migraineurs. Moreover, the study identified characteristic patterns of altered brainstem–cortex activation and interaction that play a role in the progression of episodic migraine into chronic migraine (39).

Conclusion

Proper clinical assessment of migraine-related visual symptoms is critical in chronic migraine patients. Differential diagnosis of the reported visual symptoms is required to rule out ocular pathologies and other serious secondary causes such as stroke and transient ischemic attack. Red flags include new-onset symptoms, persistent symptoms for more than one hour, symptoms affecting one eye only, onset at an older age, and additional ocular or neurologic deficits. Moreover, advancements in migraine diagnostics provide valuable tools for rapid and accurate identification of migraine symptoms and patterns, along with the possibility of prediction of migraine chronification.

Disclosure

Conflict of interest

There is no conflict of interest.

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Ethical consideration

Non applicable.

Data availability

All data is available within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

References

1. Khan J, Asoom LIA, Sunni AA, Rafique N, Latif R, Saif SA, et al. Genetics, pathophysiology, diagnosis, treatment, management, and prevention of migraine. Biomedicine & Pharmacotherapy. 2021;139:111557.

2. Dong L, Dong W, Jin Y, Jiang Y, Li Z, Yu D. The Global Burden of Migraine: A 30-Year Trend Review and Future Projections by Age, Sex, Country, and Region. Pain and therapy. 2025;14(1):297-315.

3. Aguilar-Shea AL, Membrilla Md JA, Diaz-de-Teran J. Migraine review for general practice. Atencion primaria. 2022;54(2):102208.

4. May A, Schulte LH. Chronic migraine: risk factors, mechanisms and treatment. Nature reviews Neurology. 2016;12(8):455-64.

5. Buse DC, Manack A, Serrano D, Turkel C, Lipton RB. Sociodemographic and comorbidity profiles of chronic migraine and episodic migraine sufferers. Journal of neurology, neurosurgery, and psychiatry. 2010;81(4):428-32.

6. Hanson LL, Ahmed Z, Katz BJ, Warner JEA, Crum AV, Zhang Y, et al. Patients With Migraine Have Substantial Reductions in Measures of Visual Quality of Life. Headache. 2018;58(7):1007-13.

http://dx.doi.org/10.52533/JOHS.2026.60106

7. Gollion C. Cortical excitability in migraine: Contributions of magnetic resonance imaging. Revue Neurologique. 2021;177(7):809-15.

8. Aurora SK, Barrodale P, Chronicle EP, Mulleners WM. Cortical inhibition is reduced in chronic and episodic migraine and demonstrates a spectrum of illness. Headache. 2005;45(5):546-52.

9. Chen WT, Wang SJ, Fuh JL, Lin CP, Ko YC, Lin YY. Persistent ictal-like visual cortical excitability in chronic migraine. Pain. 2011;152(2):254-8.

10. Gunes A, Demirci S, Tok L, Tok O, Koyuncuoglu H, Yurekli VA. Refractive Errors in Patients with Migraine Headache. Seminars in ophthalmology. 2016;31(5):492-4.

11. McKendrick AM, Vingrys AJ, Badcock DR, Heywood JT. Visual field losses in subjects with migraine headaches. Investigative ophthalmology & visual science. 2000;41(5):1239-47.

12. Chaliha DR, Vaccarezza M, Charng J, Chen FK, Lim A, Drummond P, et al. Using optical coherence tomography and optical coherence tomography angiography to delineate neurovascular homeostasis in migraine: a review. Frontiers in neuroscience. 2024;18:1376282.

13. Lisicki M, D'Ostilio K, Coppola G, Maertens de Noordhout A, Parisi V, Schoenen J, et al. Brain Correlates of Single Trial Visual Evoked Potentials in Migraine: More Than Meets the Eye. Frontiers in neurology. 2018;9:393.

14. Nguyen BN, Park ASY, McKendrick AM. Eccentricity Dependency of Retinal Electrophysiological Deficits in People With Episodic Migraine. Investigative ophthalmology & visual science. 2024;65(11):44.

15. Eren OE, Wilhelm H, Schankin CJ, Straube A. Visual Phenomena Associated With Migraine and Their Differential Diagnosis. Deutsches Arzteblatt international. 2021;118(39):647-53.

16. Headache Classification Committee of the International Headache Society (IHS). The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018;38(1):1-211.

17. Tukur HN, Uwishema O, Sheikhah D, Akbay H. Neuro-ophthalmology and migraine: visual aura and its neural basis. International Journal of Emergency Medicine. 2025;18(1):148.

18. Viana M, Sances G, Linde M, Ghiotto N, Guaschino E, Allena M, et al. Clinical features of migraine aura: Results from a prospective diary-aided study. Cephalalgia. 2017;37(10):979-89.

19. Sampatakakis SN, Lymperopoulos L, Mavridis T, Karagiorgis G, Papadopoulos C, Deligianni CI, et al. Visual snow: A systematic review and a case series. Cephalalgia. 2022;42(13):1409-19.

20. Silva EM, Puledda F. Visual snow syndrome and migraine: a review. Eye (London, England). 2023;37(12):2374-8.

21. Jun B. Diagnostic Considerations in Patients Presenting with Transient Vision Loss. Missouri medicine. 2016;113(1):63-7.

22. Nappi G, Jensen R, Nappi R, Sances G, Torelli P, Olesen J. Diaries and Calendars for Migraine. A Review. Cephalalgia. 2006;26(8):905-16.

23. Ascaso FJ, Marco S, Mateo J, Martínez M, Esteban O, Grzybowski A. Optical Coherence Tomography in Patients with Chronic Migraine: Literature Review and Update. Frontiers in neurology. 2017;8:684.

24. Raga-Martínez I, Povedano-Montero FJ, Hernández-Gallego J, López-Muñoz F. Decrease Retinal Thickness in Patients with Chronic Migraine Evaluated by Optical Coherence Tomography. Diagnostics (Basel, Switzerland). 2022;13(1).

25. Riederer F, Beiersdorf J, Scutelnic A, Schankin CJ. Migraine Aura-Catch Me If You Can with EEG and MRI-A Narrative Review. Diagnostics (Basel, Switzerland). 2023;13(17).

26. Lebedeva ER, Gurary NM, Gilev DV, Christensen AF, Olesen J. Explicit diagnostic criteria for transient ischemic attacks to differentiate it from migraine with aura. Cephalalgia. 2018;38(8):1463-70.

27. Hartl E, Gonzalez-Victores JA, Rémi J, Schankin CJ, Noachtar S. Visual Auras in Epilepsy and Migraine - An Analysis of Clinical Characteristics. Headache. 2017;57(6):908-16.

28. Hang C, Leishangthem L, Yan Y. Not All Cases of Visual Snows are Benign: Mimics of Visual Snow Syndrome. Neuropsychiatric disease and treatment. 2021;17:3293-300.

29. Mehta DG, Garza I, Robertson CE. Two hundred and forty-eight cases of visual snow: A review of potential inciting events and contributing comorbidities. Cephalalgia. 2021;41(9):1015-26.

30. Braca S, Santoro V, Sebastianelli G, Schankin CJ, Goadsby PJ, Puledda F. Visual snow vs. migraine aura: Debate summary and novel insights into the syndrome. Cephalalgia. 2025;45(9):3331024251365908.

31. Eren OE, Schöberl F, Schankin CJ, Straube A. Visual snow syndrome after start of citalopram-novel insights into underlying pathophysiology. European journal of clinical pharmacology. 2021;77(2):271-2.

32. Pula JH, Kwan K, Yuen CA, Kattah JC. Update on the evaluation of transient vision loss. Clinical ophthalmology (Auckland, NZ). 2016;10:297-303.

33. Nordin BA. Differentiating Visual Symptoms in Retinal Migraine and Migraine With Aura: A Systematic Review of Shared Features, Distinctions, and Clinical Implications. Cureus. 2025;17(8):e91028.

34. Istrate BM, Vîlciu C, Răgan C. Retinal migraine. Romanian journal of ophthalmology. 2020;64(2):96-9.

35. Petrušić I, Chiang CC, Garcia-Azorin D, Ha WS, Ornello R, Pellesi L, et al. Influence of next-generation artificial intelligence on headache research, diagnosis and treatment: the junior editorial board members' vision - part 2. The journal of headache and pain. 2025;26(1):2.

36. Goadsby PJ, Constantin L, Ebel-Bitoun C, Igracki Turudic I, Hitier S, Amand-Bourdon C, et al. Multinational descriptive analysis of the real-world burden of headache using the Migraine Buddy application. European journal of neurology. 2021;28(12):4184-93.

37. Petrušić I. Digital phenotyping for migraine: A game-changer for research and management. Cephalalgia. 2025;45(7):03331024251363568.

38. Hsiao FJ, Chen WT, Wu YT, Pan LH, Wang YF, Chen SP, et al. Characteristic oscillatory brain networks for predicting patients with chronic migraine. The journal of headache and pain. 2023;24(1):139.

39. Hsiao FJ, Chen WT, Liu HY, Wu YT, Wang YF, Pan LH, et al. Altered brainstem-cortex activation and interaction in migraine patients: somatosensory evoked EEG responses with machine learning. The journal of headache and pain. 2024;25(1):185.

http://dx.doi.org/10.52533/JOHS.2026.60106