

# Motion Sickness in Headache Patients

## Cinetose em pacientes com cefaleias

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### ABSTRACT

**Introduction:** Headache is one of the most frequent consultations in neurology. Some patients with headache report intolerance to passive mobilization, associated with dizziness, nausea, vomiting, known as motion sickness. These symptoms are caused by a conflict between the systems: visual, vestibular and somatosensitive. **Objective:** To determine the prevalence of motion sickness in patients who consult due to headache. **Method:** Cross-sectional, retrospective and descriptive study. It included patients over 18 years of age, who consulted for headache at the Headache Clinic, during the period from January 2 to June 30, 2017, through a structured interview. **Results:** Of a total of 266 patients: 62 (23.30%) presented motion sickness (mean age 41.5 years; 80.6% were women). 14 described motion sickness only in childhood and 48 persisted with symptoms until the time of consultation. Among the patients with headache and motion sickness 52 (83.87%) presented migraine; 7 patients presented tension headaches; 2 in salvos; 1 undetermined. The prevalence of migraine was higher in those who reported motion sickness only in childhood compared to those who continued with motion sickness (85.7 vs. 56.25%,  $p = 0.045$ ), 12.5% of patients with current motion sickness reported it as a migraine trigger, 204 patients did not have motion sickness (76.7%). **Conclusion:** We consider that in patients with headache it is important to identify motion sickness as it can be limiting and also be a migraine trigger. Its diagnosis and treatment would improve the quality of life of our patients.

**Keywords:** Individual susceptibility, Motion sensitivity, Motion sickness, Migraine.

### RESUMO

**Introdução:** Dor de cabeça é uma das razões mais frequentes de consultas em neurologia. Alguns pacientes com dor de cabeça relatam intolerância à mobilização passiva, associada a tontura, náusea, vômito, conhecida como cinetose. Esses sintomas são causados por um conflito entre os sistemas: visual, vestibular e somatossensitivo. **Objetivo:** Determinar a prevalência de cinetose em pacientes consultados por dor de cabeça. **Método:** Estudo transversal, retrospectivo e descritivo. Foram incluídos pacientes com idade superior a 18 anos, consultados para dor de cabeça na Clínica de Dor de Cabeça, do Hospital Fleni, Buenos Aires, Argentina, no período de 2 de janeiro a 30 de junho de 2017, por meio de entrevista estruturada. **Resultados:** Do total de 266 pacientes: 62 (23,3%) apresentaram cinetose (idade média de 41,5 anos; 80,6% eram mulheres), 14 descreveram-na apenas na infância e 48 persistiram com sintomas até o momento da consulta. Entre os pacientes com dor de cabeça e cinetose 52 (83,9%) apresentaram enxaqueca, 7 pacientes apresentaram cefaléia tensional, 2 cefaleia em salvas. A prevalência de enxaqueca foi maior naqueles que relataram cinetose apenas na infância em comparação aos que continuaram com ela (85,7 vs. 56,2%,  $p = 0,045$ ), 12,5% dos pacientes com cinetose atual relataram isso como um gatilho para enxaqueca. 204 pacientes não apresentaram cinetose (76,7%). **Conclusão:** Consideramos que em pacientes com dor de cabeça é importante identificar a cinetose, pois pode ser limitante e também desencadear uma enxaqueca. Seu diagnóstico e tratamento melhorariam a qualidade de vida de nossos pacientes.

**Descritores:** Susceptibilidade individual, Sensibilidade a movimentos, Cinetose, Enxaqueca.

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## INTRODUCTION

Headache is one of the most frequent causes for consultations in neurology. Headache represents a broad and heterogeneous group of clinical entities; being tension-type headache the most prevalent in the general population; followed by migraine.

Migraine prevalence varies between 10-16%, with female predominance of 3/1; representing a significant socio-economic and personal impact (1). It is among the ten most prevalent disorders and is classified as the second cause of disability of all diseases worldwide (2). Migraine is characterized by recurrent attacks of moderate to severe pain, of pulsatile characteristic, associated with photophobia or, phonophobia, nausea and / or vomiting, which sometimes becomes incapacitating for the individual's daily life, in both social and labor aspects.

Some patients who consult for headache also report intolerance to passive mobilization; known as motion sickness. More than two thousand years ago Hippocrates observed that "... Sailing in the sea caused movement disorder ... (Reason and Brand, 1975), The term "nausea" derives from the Greek root "Naus" which means a ship (3). Motion sickness is a syndrome present in healthy subjects, triggered by passive movement (car trips, trains, airplanes, ships) or by the illusion of movement (environmental movement surrounding it; exposure to 3D movies, virtual reality). Active movement of the head during a trip in a means of transport (passive movement) can cause or worsen it (3).

This syndrome is characterized by a group of signs and symptoms, among which are mentioned, dizziness, nausea, vomiting, drowsiness, yawns, irritability, paleness, bradycardia, palpitations, ataxic gait, arterial hypotension, apathy, headache. (4). The severity of symptoms varies according to individual susceptibility and the intensity of the stimulus to which the subject is exposed. Increased susceptibility has been suggested in women, the menstrual cycle being implicated as a trigger; In addition to some evidence of genetic contribution, variables such as anxiety or fear and sleep deprivation may contribute; reason why the prevalence described in the literature is very variable (1-90%) (5). Susceptibility begins around 6 or 7 years of age; with a peak between 9 and 10 years; which implies that hormonal changes per se would not have a direct effect. These symptoms are caused by incongruous sensory interactions; a conflict between the visual, vestibular and somatosensitive systems. Before an acute trigger the symptoms last for hours to a day after the stimulus is suspended; If the stimulus continues, such as a boat trip, relief occurs by central adaptation (habituation) in approximately 3 days.

## OBJECTIVES

The primary objectives of this study were to determine the prevalence of motion sickness in patients who consulted a neurology service due to headache; and identify what type of headache is most frequently associated with motion sickness. Secondary objectives,

to determine the severity of motion sickness and identify motion sickness as a possible migraine trigger.

## METHODS

A cross-sectional, retrospective and descriptive study was carried out; which included patients over 18 years of age, who consulted for headache as the primary complaint in the Headache Section of Pain Clinic, Hospital Fleni, Buenos Aires, Argentina, during the period from January 2 to June 30, 2017. A structured questionnaire was used for the interview and the data were analyzed.

Headache diagnoses were made applying the criteria of the International Classification of Headache Disorders, 2013. Motion sickness was classified using the Motion sickness susceptibility questionnaire short-form (MSSQ-Short) (6) according to the stimulus that triggers the symptom in Mild: terrestrial trigger, Moderate: aquatic trigger; Severe: aerial and visual trigger.

The STATA v13 program was used. Quantitative data were expressed in means +/- SD or numbers and their percentages. Normality was evaluated according to asymmetry, kurtosis and Z test. For the comparison of proportions, a non-parametric Wilcoxon rank-sum test was used.

Study approved by the Research and Ethics Committee, given the exception of taking informed consent.

## RESULTS

Of a total of 266 patients who consulted Fleni Hospital due to headache, 62 (23.3%) presented motion sickness, mean age was 41.5 years; 80.6% were women. Of which 14 patients described motion sickness exclusively during childhood and 48 patients reported persisting with the symptoms until the time of consultation (Graph 1). The latter were classified according to the intensity of motion sickness in: mild 64.5%; moderate 16.7% and severe 18.8%.

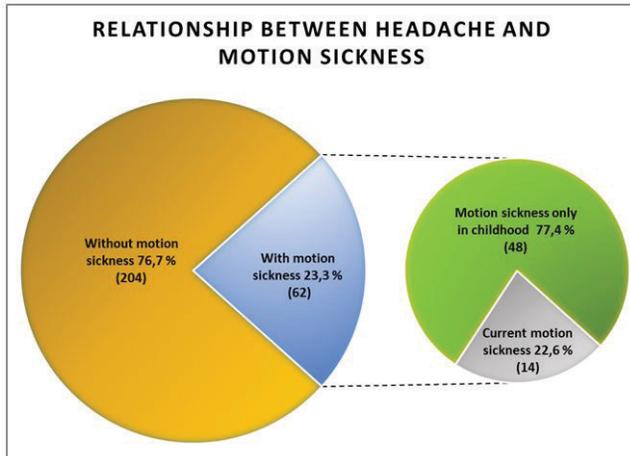
From the group of patients with headache and motion sickness; 52 (83.9%) met diagnostic criteria for migraine (62.9% episodic, 9.7% with aura and 11.3% chronic); 11.3% of patients had tension headache; 3.2% cluster headache and 1.6% headache of undetermined characteristic (Graph 2).

The prevalence of migraine was higher in those patients who reported motion sickness only in childhood compared to those who continued with motion sickness (85.7 vs. 56.2%,  $p = 0.045$ ). 12.5% of patients with current motion sickness reported it as a migraine trigger.

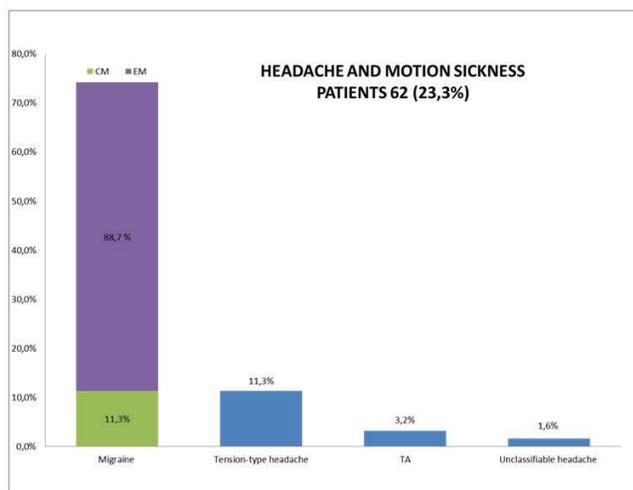
204 patients did not have motion sickness (76.7%); the average age was 43.5 years; and 81.8% were women. 83.33% presented migraine (67.6% episodic; 17.6% chronic; 14.7% with aura), 9.3% had tension headache, 2.9% cluster headache, 1.5% had undetermined headaches and 2% cranial neuralgia (Graph 3).

## DISCUSSION

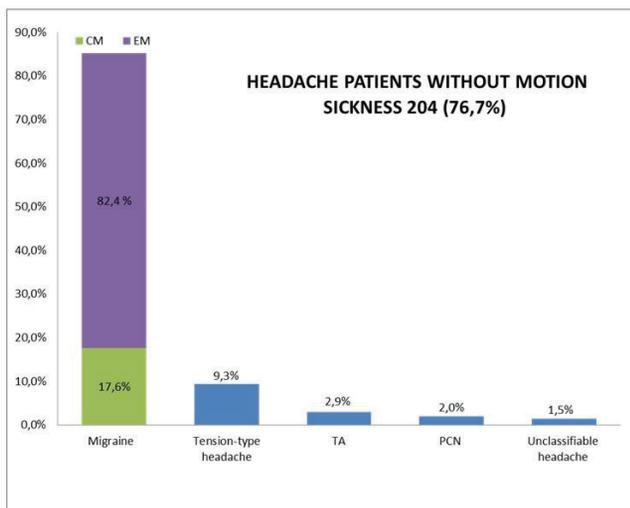
Reports in the literature describes the association between migraine and motion sickness may reach up to 50%; also 20% of patients with tension-type headache



**Graph 1.** Headache patients with Motion Sickness.



**Graph 2.** MA: migraine with aura, MC: chronic migraine, ME: episodic migraine; TA: trigemeno-autonomic cephalgias, Indet: undetermined.



**Graph 3.** MA: migraine with aura, MC: chronic migraine, ME: episodic migraine; TA: trigemeno-autonomic cephalgias, Indet: undetermined, AC: cranial neuralgias.

also experience motion sickness (7). Our study revealed a prevalence of motion sickness in patients with headache of 23.3%; of these, 84% suffered some type of migraine; and 11% had tension headache; 12.5% reported motion sickness as a trigger for a migraine attacks.

Motion sickness not only interferes with long-distance trips such as pleasure trips; but also in those of short distance, such as daily transfers to work, activities such as going to a shopping, supermarket or cinema. It affects both adults and children. At present, the use of mobile devices during the trips, possibly facilitates the increase of this symptom; since performing active movements during a passive movement favors its presentation.

Given that it is a frequent condition, which can become disabling and even trigger a migraine attack, it must be taken into account in the medical consultation, in order to indicate the appropriate treatment, both non-pharmacological and pharmacological (scopolamine, promethazine, anti-histamines). Rizatriptan was studied as a preventive treatment (prior to the exposure of stimuli) of motion sickness (8) showing clinical improvement.

A group of patients identified motion sickness as a trigger for a migraine attacks. This information could be useful to evaluate the clinical behavior of the migraine attacks, so recognizing it may be helpful in its management.

## CONCLUSION

Motion sickness is an important issue in migraine management, causing limitations in daily life activities. In first consultations, headache patients should be asked about it, since proper diagnosis and timely treatment would make it possible to improve patients' quality of life. Future research should be done to better clarify motion sickness as a migraine trigger.

## REFERENCES

1. Guía diagnóstica y terapéutica de la Sociedad Española de Neurología 2015.
2. GBD 2015 Disease and injury incidence and prevalence collaborators (2016) Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 388:1545–1602
3. Bertolini G and Straumann D; Moving in a Moving world: A Review on vestibular Motion Sickness; (2016), *Front. Neurol.* 7:14.
4. Martínez F, Bots L; Motion sickness; *Journal FASO*, año 23, suplemento 2; 2016.
5. Sanchez Blanco C; Cinetosis. *Rev. Soc. Otorrinolaringol. Castilla Leon Cantab. La Rioja* 2014 Nov. 5 (28): 233-251
6. Golding J.F; Predicting individual differences in motion sickness susceptibility by questionnaire. *Personality and Individual Differences* 41 (2006) 237–248.
7. Dawn M; Motion Sickness and Migraine; *Headache* 2007; 47: 607-610).
8. Joseph M.F; Rizatriptan reduces vestibular-induced motion sickness in migraineurs; *J Headache Pain* (2011) 12:81-88.
9. Murrin L, Chamberlain F, Cheema S; Motion sickness in migraine and vestibular disorders; *J Neurol Neurosurg Psychiatry* 2015;86:585–587.

10. Schmäl F, Neuronal Mechanisms and the Treatment of Motion Sickness; *Pharmacology* 2013; 91: 229–241.
11. Bisdorff A, Migraine and dizziness, *Curr Opin Neurol* 2014, 27:105–110.
12. De Marinis, M. Comment on Visual pattern responses in migraine with and without motion sickness; *Cephalalgia* 2010, 30(12) 1537.
13. Carvalho, GF. Presence of vestibular symptoms and related disability in migraine with and without aura and chronic migraine; *Cephalalgia* 2019, 39(1) 29–37.
14. Golding J.F; Motion sickness susceptibility questionnaire revised and its relationship to other forms of sickness. *Brain Research Bulletin*, Vol. 47, No. 5, pp. 507–516, 1998.
15. Sanchez-Blanco C; Motion sickness; *Rev. Soc. Otorrinolaringol. Castilla Leon Cantab. La Rioja* 2014 Nov. 5 (28): 233-251.
16. Cuomo-Granston A; Migraine and motion sickness: What is the link?; *Progress in Neurobiology* 91 (2010) 300–312.
17. Lackner J.R; Motion sickness: more than nausea and vomiting; *Exp Brain Res* (2014) 232:2493–2510.
18. Wesley W.O. Krueger, M.D.; Controlling Motion Sickness and Spatial Disorientation and Enhancing Vestibular Rehabilitation with a User-Worn SeeThrough Display; *Laryngoscope*. 2011 January ; 121(0 2): S17–S35. doi:10.1002/lary.21373.
19. Wang J, Lewis RF. Contribution of intravestibular sensory conflict to motion sickness and dizziness in migraine disorders; *J Neurophysiol* 116: 1586 –1591, 2016.
20. Ashton Graybiel, DIAGNOSTIC CRITERIA FOR GRADING THE SEVERITY OF ACUTE MOTION SICKNESS; *Bureau of Medicine and Surgery MRO05.04-002 NASA Order R-93 1 .156 z*; 1968.
21. Conforto A.B; Migraine and motion sickness independently contribute to visual Discomfort; *Cephalalgia* 2010, Vol 30(2) 161-169.
22. Carvalho G.F; Presence of vestibular symptoms and related disability in migraine with and without aura and chronic migraine; *Cephalalgia* 2019, Vol. 39(1) 29–37.
23. Yates Bill J; Integration of Vestibular and Emetic Gastrointestinal Signals that Produce Nausea and Vomiting: Potential Contributions to Motion Sickness; *Exp Brain Res*. 2014 August ; 232(8): 2455–2469.
24. III Edición de la Clasificación Internacional de las Cefaleas; versión beta, ICHD-III 2013; Sociedad Internacional de Cefaleas (IHS).