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Original

Hyperacusis in migraine: pilot project

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Abstract

Introduction

Patients with migraine may report hearing disorders, such as hyperacusis and phonophobia.

Objectives

To evaluate the prevalence and predictors of hyperacusis in patients with migraine.

Methods

A prospective case-control study was carried out at the specialties outpatient clinic of PUC-PR, campus Londrina. The present study included adult patients diagnosed with migraine. Study participants completed a structured interview on demographic and anthropometric data and clinical characteristics of migraine. They also completed validated questionnaires on depression (BDI), anxiety (STAI2), disability (MIDAS), allodynia (ASC-12), and the hyperacusis questionnaire. Two hundred seventy-six patients with migraine answered the questionnaires. The participant was considered to have hyperacusis when the score was greater than or equal to 22 points.

Results

We evaluated 276 individuals with migraine who answered the questionnaires, 162 without hyperacusis, and 114 with hyperacusis. Regarding the univariate analyses, episodic migraine (p=0.001; OR=2.28), phonophobia (p=0.017; OR=2.56), osmophobia (p<0.001; OR=2.97) and allodynia (p<0.010; OR= 2.91) showed significant results in patients with hyperacusis. Patients without a trace of anxiety (p=0.007; OR=10.53) and absence of depression (p=0.002; OR=2.89) were also related to hyperacusis.

As for multivariate analyses, patient characteristics that were significantly associated with hyperacusis include episodic migraine (p=0.019; OR=2.029), osmophobia (p=0.022; OR=2.214), and mild and moderate migraine-related disability. (p=0.022; OR=2.158).

Conclusions

Patients with episodic migraine who have osmophobia and mild to moderate disability related to this neurological disease are twice as likely to have hyperacusis, being considered important predictors of such hearing disorder. The presence or absence of aura and photophobia did not present results with relevant statistical differences.

Keywords:
Migraine
Hyperacusis
Phonophobia

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Introduction

Migraine is a brain disorder that presents neurological symptoms with headache attacks. The pain may be unilateral, moderate to severe in intensity, associated with nausea, vomiting, photophobia and phonophobia. There are even cases of sensory, motor, and emotional impairment. In addition, it commonly has a family history.[1] Besides, migraine has several distinct classifications. Among these, the most relevant are migraine with aura (before called as classic migraine), that is usually preceded by visual, sensory, or language symptoms.[1]

According to the International Headache Society, the following criteria are used to diagnosemigraine without aura.[2]

A. At least 5 headache attacks in a lifetime;
B. Episodes lasting 4 to 72 hours when untreated or ineffectively treated;
C. Headache with at least two of the following characteristics: unilateral; pulsatile; moderate to severe pain; and worsening of the condition with day-to-day activities or impossibility to perform such activities due to intense pain;
D. Headache accompanied by at least one of the following: nausea and/or vomiting; photophobia and phonophobia.
Balance disturbances such as rational vertigo, positional vertigo, dizziness, and others have also been related during headache attacks.[3-12] Thus, studies indicate that patients diagnosed with migraine who have experienced kinetosis at some point in their lives seem to be more susceptible to migraine attacks.[3,12-17]

In addition, this type of headache may be associated to the development of hearing disorders such as hyperacusis and phonophobia.[18] Hyperacusis is an unpleasant sensation caused by exposure to sound, due to a reduction in one's tolerance.[19] It is characterized by increased sound sensation in the auditory pathway and loss of the dynamic range of the ear.[20] In the case of phonophobia, only certain sounds are uncomfortable, while others can be comfortable even at high intensities.[21]

The primary difference between migraine with aura and migraine associated with auditory-vestibular dysfunction is the duration of the headache. In cases of migraine associated with auditory vestibular dysfunction, symptoms may last for hours, days, or weeks, while the symptoms of migraine with aura last from seconds to 1 hour.[22]

Another very characteristic symptom of migraine associated with auditory-vestibular dysfunction is motion intolerance, like kinetosis. Patients with such dysfunction report vertigo whenever their head is in the trigger position.[23] Cases of visual vertigo, which are usually induced by screens and specific illumination, are also characteristic of the picture.[24]

Hyperacusis can be diagnosed by Loudness Discomfort Level (LDL)[25], which will be responsible for evaluating the degree of discomfort of a sound at each frequency.[26] The test starts by presenting the sound from 50[25] or 60 dB NA, increasing to 5dB with time, with stimulus onset at a frequency of 500 Hz amplifying to 1,000, 2,000 or 4,000 Hz[27], and duration of two seconds each stimulus, with a one-second interval between stimuli.[25] The patient is instructed to notify the exact moment the sound becomes uncomfortable.[27]

The reference values for LDL were analyzed in two studies of normal-hearing individuals without complaints of auditory hypersensitivity, both studies obtained average results of the level of discomfort from 100 dB NA.[27,28] In another study, with the stimulus frequency ranging from 500 to 8,000 Hz, the reference value of LDL for normal hearing was 86 to 98 dB NA.[25]

In the study done in patients with hyperacusis, the LDL reference values ranged between 50 and 90 dB HL. To classify the degree of hyperacusis, the Johnson Hyperacusis Dynamic Range Quotient (JHQ) which is given by subtracting the LDL by the pure tone threshold (AL), this result is still divided by the frequencies used in the study, to obtain the JHQ, it is still necessary to add the dynamic ranges, divided by the number of frequencies evaluated. The scale of the degree of hyperacusis, from the JHQ, can be mild (75-90 dB), moderate (50-74 dB), severe (30-49 dB) or profound (0-29 dB).[28]

Also in the same study, a questionnaire was used to differentiate between patients who have hyperacusis and those who do not. The questionnaire is divided into three parts. The first part consists of questions about hypersensitivity to sound, whether it is present, the degree and types of sound that cause discomfort to the individual, triggers, and reactions to hearing hypersensitivity. The second part addresses questions about hearing loss and exposure to intense sound. The third part is questions about personal background and existing medical conditions, including migraine.[28]

Two other studies used a unique questionnaire for patients with hyperacusis, which assess which sounds are uncomfortable and what the individual's reaction to uncomfortable sounds. The sounds questioned in the studies are: loud music, horns, people talking loudly, traffic noise, slamming doors, sudden and loud sounds, dripping faucet, restaurant noise,

doorbell, police siren, airplane, plastic bag noise, blender, telephone ringing, loud laughter, airplane noises, barking dogs, firearms, children crying, television at normal volume, simultaneous conversation, and music at normal volume. The behavioral reactions present in the questionnaire are irritation, anxiety, need to leave the sound, tinnitus, tension, disorientation, aggressiveness, pain, dizziness, anger, shock, panic, fear, momentary stress, loss of concentration and headache.[29,30]

Method

After submission and approval of the research by the Research Ethics Committee (no 3.029.972), a prospective case-control study was carried out at the specialties outpatient clinic of PUC-PR, campus Londrina. The present study included patients diagnosed with migraine, 18 years old or older and younger than 60 years old. Study participants completed a structured interview on demographic and anthropometric data and clinical characteristics of migraine. They also completed validated questionnaires on depression (BDI), anxiety (STAI2), disability (MIDAS), allodynia (ASC-12), and the hyperacusis questionnaire. The questionnaires were answered by 276 patients with migraine. The hyperacusis questionnaire was composed of 14 questions to classify the patients who have hyperacusis and those who do not have hyperacusis. Each answer marked "no" corresponds to 0 points; "yes, a little" corresponds to 1 point; "yes, fairly" corresponds to 2 points; and "yes, a lot" corresponds to 3 points. The participant was considered to have hyperacusis when the score was greater than or equal to 22 points. In the statistical analysis it was considered the significance value $p<0.05$.

Results and Discussion

We evaluated 276 individuals with migraine who answered the applicable questionnaires, 162 without hyperacusis and 114 with hyperacusis. Results of univariate and multivariate analyzes were obtained, relating patients with hyperacusis according to age, sex, ethnicity, BMI, type of migraine, presence of aura, phonophobia, photophobia, osmophobia, allodynia, anxiety, depression and disability (Table 1).

Table 1. Comparative analysis of individuals without hyperacusis and with hyperacusis diagnosed with migraine.

		Without hyperacusis N= 162		With hyperacusis N=114		Univaried Analysis		Multivariate Analysis	
					Median	*p*	OR	*p*	OR
Age (median)		30		33				0.614	0.994
		n	**(%)**	**n**	**(%)**				
Sex	Male	28	17.30	11	9.60	0.073	1.96	0.555	1.296
	Female	134	82.70	103	90.40				
Ethnicity	Caucasian	135	83.30	92	80.70	0.573	1.2	0.620	0.83
	Non caucasian	27	16.70	22	19.30				
BMI_dico_29_30	Without obesity (BMI<30)	135	83.90	93	81.60	0.622	1.17	0.637	0.829
	Obesity (BMI≥30)	26	16.10	21	18.40				
Migraine Type	Episodic	113	70.60	58	51.30	0.001*	2.28	0.019	2.029
	Chronic	47	29.40	55	48.70				
Migraine with aura	No	103	63.60	67	58.80	0.419	1.22	0.935	1.025
	Yes	59	36.40	47	41.20				
Phonophobia	No	29	18.00	9	7.90	0.017*	2.56	0.090	2.221
	Yes	132	82.00	105	92.10				
Photophobia	No	10	6.20	7	6.10	0.981	1.01	0.482	0.643
	Yes	151	93.80	107	93.90				
Osmophobia	No	62	38.30	19	17.30%	<0.001*	2.97	0.022	2.214
	Yes	100	61.70	91	82.70%				
ASC12_dico	Mild or none (0-5)	97	60.20	39	34.20%	<0.001*	2.91	0.056	1.773
	Moderate to severe (≥6)	64	39.80	75	65.80%				
Anxiety-Trait	Without anxiety	161	99.40	107	93.90%	0.007*,b	10.53	0.224	4.179
	With anxiety	1	0.60	7	6.10%				
Depression	Without depression	147	90.70	88	77.20%	0.002*	2.89	0.153	1.868
	With depression	15	9.30	26	22.80%				
MIDAS_dico10_11	Mild disability or none	143	90.50	88	77.20%	0.002*	2.81	0.022	2.518
	Moderate to severe disability	15	9.50	26	22.80%				

Regarding the univariate analyses, episodic migraine (p=0.001; OR=2.28), phonophobia (p=0.017; OR=2.56), osmophobia (p<0.001; OR=2.97) and allodynia (p<0.010; OR= 2.91) showed significant results in patients with hyperacusis. Patients without trace of anxiety (p=0.007; OR=10.53) and absence of depression (p=0.002; OR=2.89) were also related to hyperacusis.

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Conclusion

Patients with episodic migraine who have osmophobia and mild to moderate disability related to this neurological disease are twice as likely to have hyperacusis, being considered important predictors of such hearing disorder. The presence or absence of aura and photophobia did not present results with relevant statistical differences (p>0.05).

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