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CASE REPORT

Hearing voices: does it give your patient a headache? A case of auditory hallucinations as acoustic aura in migraine

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Objective: Auditory hallucinations are generally considered to be a psychotic symptom. However, they do occur without other psychotic symptoms in a substantive number of cases in the general population and can cause a lot of individual distress because of the supposed association with schizophrenia. We describe a case of nonpsychotic auditory hallucinations occurring in the context of migraine.

Method: Case report and literature review.

Results: A 40-year-old man presented with imperative auditory hallucinations that caused depressive and anxiety symptoms. He reported migraine with visual aura as well which started at the same time as the auditory hallucinations. The auditory hallucinations occurred in the context of nocturnal migraine attacks, preceding them as aura. No psychotic disorder was present. After treatment of the migraine with propranolol 40 mg twice daily, explanation of the etiology of the hallucinations, and mirtazapine 45 mg daily, the migraine subsided and no further hallucinations occurred. The patient recovered.

Discussion: Visual auras have been described in migraine and occur quite often. Auditory hallucinations as aura in migraine have been described in children without psychosis, but this is the first case describing auditory hallucinations without psychosis as aura in migraine in an adult. For description of this kind of hallucination, DSM-IV lacks an appropriate category.

Conclusion: Psychiatrists should consider migraine with acoustic aura as a possible etiological factor in patients without further psychotic symptoms presenting with auditory hallucinations, and they should ask for headache symptoms when they take the history. Prognosis may be favorable if the migraine is properly treated. Research is needed to explore the pathophysiological mechanism of auditory hallucinations as aura in migraine.

Keywords: auditory hallucination, acoustic aura, migraine, psychosis, DSM-IV, case report

Introduction

Migraine

Migraine and mental disorders are highly prevalent and indications are that they may often co-occur. Epidemiological research in a random general population sample of 6491 adults in The Netherlands showed that the lifetime prevalence for migraine (according to the 1988 International Headache Society criteria) was 33% for women, and 13% for men in 1998.[1] In this sample, patients with migraine in the last year suffered a median of twelve attacks per year and 25% had at least two attacks per month. In this group, migraine attacks were sometimes preceded by aura symptoms in 31% of cases.[1] Prevalence rates seem to differ between countries. For example, the American Migraine Prevalence and Prevention (AMPP) Study analyzed symptoms and treatment patterns in

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a representative sample of 162,576 Americans aged 12 years and older in a mail survey performed in 2006 and found that approximately 17.1% of women and 5.6% of men have migraines, based on criteria proposed by the *International Classification of Headache Disorders*, 2nd Edition.[2]

Chronic migraine is classified amongst the chronic daily headaches,[3] that is, a headache occurring with a frequency of 15 or more days per month for at least 3 months.[4] Chronic migraine occurs in 2.4% of the general population.[5,6] Thirty-four percent of migraine patients suffer from a lifetime depressive disorder[7] and depressive symptoms may occur in up to 80% of people with chronic migraine.[6,8]

However, in the specialty mental health setting, this comorbidity often goes unnoticed because no attention is paid to the possibility of the co-occurrence of two disorders. This may be particularly true for migraine attacks accompanied by auras, if the auras are presented as the aura phenomenon without mention of the headache that follows the aura. Moreover, not all auras have to be followed by a headache in migraine, which complicates recognition even further.[3] Insufficient knowledge or awareness of this possible comorbidity may then lead to a diagnosis of psychopathology without taking the possible etiological role of migraine into account.

Migraine aura

In a migraine attack, in general there is a premonitory phase that may last for days, an aura phase that generally lasts less than an hour, a headache phase, and a postdromal phase. These phases blend.

A migraine attack often presents with visual auras, which have long since been described extensively[9] and seem to have remained the same in phenomenology.[5] Visual auras may be flashing lights, slowly progressing block-like signs protruding in the visual field, or a sense of wavering or blurred vision.

Other abnormal perceptions as aura, such as visual distortions[10] and olfactory sensations, have been described.[3,11] Migraine may also present with an aura of higher mental functions and without the subsequent headache, but with so-called migraine equivalents,[12] such as confused states (mostly in children)[13] or dysphasia.[14] Auditory aura symptoms in migraine can be noises, unilateral tinnitus, phonophobia, or temporary hearing loss; vestibular involvement may cause vertigo.[15]

Auditory hallucinations in migraine

Auditory hallucinations (the perception of sounds without identifiable external stimulus) have been described in children without psychosis suffering from migraine.[16,17] However, so far no case of an adult with auditory hallucinations without psychosis in migraine has been described. The following case illustrates why it may be relevant to ask a patient with auditory hallucinations if s/he suffers from headaches.

Case

A 40-year-old man, married with three children, presented to our clinic because he had experienced an imperative auditory hallucination that suggested that he should kill his son. The hallucination occurred when he woke up after falling asleep watching the television. The patient never had such hallucinations before and he had no history of mental disorder. In the week after the hallucination occurred, he started to develop depressive and anxious symptoms such as sleep disturbance, self-reproach, and worrying. He sought help from a priest, who recommended prayer, and then from his general practitioner (GP), who prescribed oxazepam 10 mg daily and referred the patient to our clinical center for help. The patient presented his thoughts about the hallucination and did not understand why he had heard this voice. According to him and his wife, there was no life event or problem preceding this experience that could explain the content of the hallucination. He loved his son of 13 years, who was "the apple of his eye". He felt guilty about the hallucination and complained of sleeping problems and irritability. In the psychosocial interview performed by the psychiatric nurse as well as the semi-structured clinical diagnostic interview performed by the psychiatrist, there were no indications for delusions, disturbed thinking, or other cognitive or psychotic symptoms. Although the patient did develop some depressive symptoms after this event, namely feelings of guilt, irritability and sleeping problems, core symptoms of depressed mood and anhedonia were lacking. The patient was not suicidal and strongly denied having the urge or wish to kill his son.

When asked about any occurrence of headaches, the patient indicated that he had never suffered headaches before, but that he started having headaches 6 weeks preceding the auditory hallucination. The first headache attack was preceded by blurred sight and flashes of light, followed by a throbbing unilateral pain at the temple. A similar attack preceded by similar visual effects followed 1 week later, and since then the attacks followed regularly, several times per week. The headache was one-sided and pounding. The event of an auditory hallucination thus occurred 6 weeks after the start of the first episode of headache that seemed suspect to be migraine with visual aura. However, 7 weeks

after the first auditory hallucination, a second event of a similar imperative auditory hallucination occurred and was reported by the patient. The auditory hallucinations both occurred when awakening at night and were followed by headache. This sequence of events made the patient very anxious, and consultation by a neurologist was requested. Possible reasons for the first occurrence of migraine such as changes in sleeping pattern, stress, exercise, and exposure to bright lights were checked, but no indications for such events were present. A somatic screening by the nurse practitioner did not disclose any abnormalities, particularly of vision, hearing, and nervous system.

Treatment was started with mirtazapine 15 mg daily and dosage increased to 45 mg daily in order to alleviate sleeping problems as well as anxiety and depressive symptoms.

The patient visited the neurologist under the suspicion of migraine attacks with aura. The patient did not report a history of narcolepsy or epilepsy. The neurologist did not find any abnormalities in the somatic check-up, and a magnetic resonance imaging (MRI) scan and electroencephalography (EEG) did not show any abnormalities. The diagnosis of migraine with visual aura was confirmed. Treatment was started with propranolol 40 mg twice daily in order to prevent further attacks. Furthermore, the patient received an explanation that he suffered from migraine with visual auras. Also, the possibility was discussed that the two events involving hearing voices had been acoustic auras preceding the migraine attacks, which had nothing to do with real intentions of the patient. This was also discussed with his wife, who had become anxious that her husband might have become schizophrenic. After the start of treatment with propranolol and this explanation, the patient did not have any further migraine attacks, and no auditory hallucinations recurred during a follow-up period of 4 months. He and his wife were happy with the explanation. Sleeping problems and depressive symptoms subsided, irritability diminished, and mirtazapine was advised to be discontinued at a later stage. The episode of migraine attacks had lasted 3 1/2 months and had subsided shortly after the start with propranolol. The case report is summarized following the principles of the Biopsychosocial Assessment Instrument[18] in Tables 1 and 2.

Discussion

This case shows a new episode of migraine in a 40-year-old patient without history of migraine or mental disorder and without clear reasons for this onset of migraine, such as change in sleeping pattern or stressors. The migraine takes a course of frequent attacks, at least twice a week, in which the attacks regularly were accompanied by visual auras. After 6 weeks of frequent migraine attacks, in a time span of 7 weeks, twice an auditory hallucination occurred followed by headache, and the second one of them occurred even after treatment with a benzodiazepine had started. The auditory hallucinations stopped when the migraine attacks stopped, after starting treatment with propranolol. The episode of migraine attacks lasted 3 1/2 months. According to the nomenclature, this was a case of chronic daily headache, namely nocturnal migraine with aura, which lasted more than 3 months and occurred at least 15 days per month. The patient did not present with migraine as the focus, but the auditory hallucination had upset him and his family greatly. The possible link with the migraine was considered only secondarily, when no indications for development of a psychotic disorder could be found.

Hallucinations without psychosis

Auditory hallucinations occur in psychotic syndromes such as schizophrenia. However, they can also occur as an isolated symptom in patients who do not experience any other symptoms associated with psychosis. Not all hallucinations are indicative of psychotic disorder. In particular, hallucinations occurring around sleep, ie, hypnagogic (occurring when the patient falls asleep) or hypnopompic (occurring when the patient awakes) hallucinations were found to have no association with other mental pathology in more than half of the cases in the adult general population.[19]

Although some cases of auditory hallucinations in adult migraine patients have been described before,[20] they all occurred in the context of psychosis and separate from the migraine attacks. In this case, the hallucinations occurred without psychosis and they closely preceded the headache in the migraine attack. The reason to consider this patient as not psychotic despite the fact that he had hallucinations was the lack of other symptoms indicative of psychosis, as well as the fact that the patient clearly distanced himself from the content of the hallucinations. Also, although the patient experienced distress, there was no pattern of general deterioration of function. Therefore, this patient was not diagnosed with a psychosis due to a general medical condition or with another psychotic disorder.

Auditory hallucination as acoustic aura

This hallucination seemed of hypnopompic nature, which may have to do with the fact that the migraine attacks of this patient started at night (so-called nocturnal migraine)

Table 1 Biopsychosocial model of case of auditory hallucinations as acoustic aura in migraine: history and diagnostic phase

Axis	History				Diagnostic phase		
Time	**T0**	**1 week**	**6 weeks**	**7 weeks**	**12 weeks**	**13 weeks + 3 days**	**13 weeks + 5 days**
Somatic	1st migraine attack with visual aura	2nd migraine attack with visual aura	Biweekly migraine attack with and without visual aura	Biweekly migraine with and without visual aura R/oxazepam 10 mg daily	Biweekly migraine with and without visual aura	Biweekly migraine with and without visual aura R/start mirtazapine 15 mg and later elevated to 45 mg daily	Diagnosis: migraine with visual aura No narcolepsy No epilepsy No EEG or MRI abnormalities No abnormalities of vision or hearing
Psychological	No history		1st hypnopompic Auditory hallucination Followed by headache	Anxiety, sleeplessness	Anxiety, sleeplessness, depressive symptoms Diagnostic interviews: no indications for psychosis, dissociation, or cognitive decline	2nd hypnopompic Auditory hallucination Followed by headache	Diagnosis: 1. No psychosis 2. Auditory hallucination as acoustic aura in chronic migraine 3. Auditory hallucination misinterpreted as psychotic symptom
Health care use	No history			Visits GP who prescribes oxazepam daily	Patient presents at Clinical Centre for Body, Mind and Health Somatic screening by Nurse Practitioner Psychosocial interview by psychiatric nurse Semistructured clinical diagnostic interview by psychiatrist		Consultation Neurologist Somatic screening, EEG and MRI scan
Social system	40-year-old male, happily married Three kids Employed		Family upset	Visits priest who recommends prayer	System intake: Wife is afraid that patient is schizophrenic and might kill son		Diagnosis: family is afraid about the beginning of schizophrenia in patient

Abbreviations: EEG, electroencephalography; GP, general practitioner; MRI, magnetic resonance imaging.

Table 2 Biopsychosocial model of case of auditory hallucinations as acoustic aura in migraine: treatment and follow-up phase

Time	18 weeks	22 weeks	30 weeks
	Treatment	**Follow up**	**Referral back**
Somatic	R/propranolol 40 mg twice daily	Continue propranolol and mirtazapine Discontinue oxazepam No migraine attacks	Continue propranolol 40 mg No migraine attacks
Psychological	Explanation of the symptom: acoustic aura	Less anxiety and depressive symptoms No recurrence of hallucinations	Symptoms in remission
Health care use	Monitoring by Clinical Centre for Body, Mind and Health	Continued monitoring	Referral back to GP with explanation about suggested discontinuation of mirtazapine after 6 months
Social system	Explanation to patient and wife of the patient that he is not schizophrenic	Family is calming down	No events

Abbreviation: GP, general practitioner.

and caused the patient to awake.[21] Although the auditory hallucinations did occur in the same timeframe as the frequent migraine attacks, and although they may have occurred an hour before the headache started, this was difficult to ascertain because the hallucinations and the headache started at night when the patient slept and woke him up from sleep. However, it may be reasonable to assume that the hallucinations were linked to the migraine as they occurred in close relation to the migraine attacks, closely preceded the headache phase, and subsided when the migraine attacks subsided with preventive treatment.

We hypothesize that a chronic migrainous process may enhance potentiation of the auditory cortex and may in some cases evoke acoustic auras with auditory hallucinations, as research with auditory evoked potentials (AEPs) showed lack of habituation in the auditory cortex in migraineurs.[22] In this particular case, the patient suffered from migraine attacks for 6 weeks before the first auditory hallucination, and the second auditory hallucination occurred after another subsequent episode of frequent migraine attacks of 7 weeks, as indicated in Table 1. This time interval might be sufficient for potentiation. However, if and how such potentiation might have led to an auditory hallucination as aura should be the focus of further research.

DSM-IV classification

The depressive and anxiety symptoms of the patient were of short duration and subsided with explanation of the symptom and mirtazapine. Also, they did not include the required core symptoms for major depressive disorder. The DSM-IV classification of this patient is shown in Table 3. The limitations of DSM-IV are quite obvious in this case. In view of the work of Ohayon,[19] the fact that a hallucination that does not occur in the context of a psychotic disorder cannot be classified as such is a shortcoming of DSM-IV that hopefully may be addressed in DSM-V.

Treatment and prognosis

This particular patient reacted well upon explanation of the symptom to himself and his wife, which calmed him and his family, and upon preventive treatment of the migraine attacks with propranolol, the most effective medication for prevention of attacks in migraine patients.[23] Mirtazapine was useful to enhance sleep and to reduce the anxiety and depressive symptoms of the patient.

The possibility of a favorable prognosis in case of appropriate explanation and treatment emphasizes the importance of recognizing migraine as a possible factor in patients presenting themselves in psychiatric settings. This has already been emphasized in the context of migraine and comorbid depressive disorder.[7] Mercante and colleagues describe the Beck Depression Inventory as an appropriate instrument to detect depression in patients with chronic migraine.[6] However, in specialty mental health settings, professionals are confronted with patients presenting psychological symptoms and their awareness should be directed conversely, namely towards the possibility of migrainous comorbidity that might be relevant for the presented psychological symptoms. This holds for depressive symptoms, but this case shows that it is also relevant in case of symptoms suggesting psychosis, such as auditory hallucinations.

Table 3 Patient DSM-IV classification

Axis I: Adjustment disorder with mixed anxiety and depressed mood
Axis II No diagnosis
Axis III Migraine with Auditory Hallucination as Aura
Axis IV 0
Axis V 80/90

Limitations

This is the first case reporting auditory hallucinations without psychosis as possible acoustic aura in an adult with migraine. Nevertheless, there are limitations. It could be that the auditory hallucinations happened just by chance in the same period as when developing migraine attacks, and did disappear just by chance when the migraine attacks disappeared. Also, unfortunately, the exact time sequence between possible aura and the onset of the attack, which should officially be less than an hour to be classified as an aura, remained unclear because the attacks occurred at night. Obviously, it is hard to prove causality in a case report.

Strengths

However, the fact that the auditory hallucinations and the migraine attacks occurred twice in the same sequence and in the same night, disappeared together under propranolol (medication known to have a strong preventive effect on migraine attacks), and did not react to other psychotropic medication, ie, oxazepam, suggests a relationship between the auditory hallucinations and the migraine that may include the possibility of auditory hallucinations as acoustic aura preceding the migraine attack.

Research implications

Therefore, this may be of great interest for the research field. In the future, structured, prospective research is needed on the co-occurrence of these two phenomena to explore if this happens more regularly and thus cannot be considered a chance phenomenon. Also, research should explore the pathophysiological mechanisms involved in the relationship between migraine and auditory hallucinations as acoustic aura. Such research might include testing of visual and auditory systems before and after treatment in patients with auditory hallucinations as acoustic aura in migraine. Also, the possibility of the etiological role of potentiation in the auditory cortex in migraine might be explored.[22]

Conclusion

This case report shows that auditory hallucinations without other signs of psychosis may be a reason to explore the possibility of migraine with acoustic aura. In this case study, diagnosis and treatment of migraine had a favorable impact on auditory hallucinations, migraine attacks, and general mental wellbeing in a patient without other signs of psychosis.

Psychiatrists should consider migraine with acoustic aura as an etiological factor in patients without psychosis who present with auditory hallucinations, and they should ask for headache symptoms when they take the history. Prognosis may be favorable if the migraine is properly treated.

In view of the possible importance and of the general lack of studies in this field, research into the epidemiology and the possible pathophysiological mechanisms of acoustic aura of auditory hallucinations in adults with migraine is needed.

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Disclosure

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