Migrainous olfactory hallucinations

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**Summary** Three patients with olfactory hallucinations related to migraine are described.

Olfactory hallucinations are recognised as aura in complex partial seizures. Olfactory hallucinations in association with migraine are not well known. They were mentioned by Bary in 1895.1 We describe three patients and discuss the differential diagnosis and possible mechanisms.

**Case reports**

**Case 1** From the age of 12 years, a 30 year old woman had suffered from episodes during which she perceived the same repulsive smell. This was of sudden onset and lasted between 5 minutes and 2 hours. It was followed by feelings of anger and depression, then depression, then anxiety. This last phase lasted about an hour and was accompanied by the hearing of familiar voices, especially her mother, berating and cramp-like feeling across the back of the neck. This was usually followed by a hemicranial headache lasting several hours, usually on the right side, associated with nausea, and sometimes with numbness in the right arm. During the attacks there was no alteration in consciousness. They occurred 2–3 times a year, though sometimes at weekly intervals. From the age of 18 to 20 she was treated with carbamazepine which she stopped because there was no change in the frequency of attacks. Her sister and her grand- mother suffered from migraine. Examination was normal. EEG revealed frequent bilateral generalised paroxysms of high voltage (up to 140 μV), theta and delta activity, and irregular background theta and some delta activity in the temporal regions, right more than left. A CT scan was normal. She was seen during a severe attack in which the headache lasted 4 days, at a time when the attacks were occurring weekly. She was given propranolol 10 mg tds and had no more attacks over the following 6 months except once, when propranolol was stopped temporarily.

**Case 2** A 37 year old woman had suffered from episodic headaches since childhood. These started suddenly with the perception of an unusual unidentifiable smell, lasting between 5 minutes and 24 hours, and were followed by vertigo and tinnitus lasting a few minutes. She then developed a hemicranial (usually left-sided) headache lasting 1 to 3 hours, often associated with nausea. These attacks occurred two to three times a month and were associated with no impairment of consciousness. She received carbamazepine for 2 years with no improvement. During pregnancy she had had two grand mal seizures diagnosed as eclampsia. Examination was normal. Carbamazepine was discontinued, and she was treated with propranolol 20 mg tds. Over the next 10 months she had one episode of olfactory hallucination lasting 10 minutes, followed by vertigo for a few seconds, and two episodes of lateralised headache.

**Case 3** A 25 year old woman had suffered from right or left sided headaches since the age of 12 years. A typical attack began with pain behind the eye spreading to the side of the head followed by dizziness, tinnitus, vomiting and impaired vision. This was often associated with paraesthesiae, weak-

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**Table Olfactory hallucinations in migraine**

<table>
<thead>
<tr>
<th>Author</th>
<th>Age</th>
<th>Sex</th>
<th>Family history</th>
<th>Quality</th>
<th>Smell duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woberg and Zeigler13</td>
<td>32</td>
<td>F</td>
<td>+</td>
<td>Decaying animal, gas, burning cookies, woodchips</td>
<td>20 min House was searched</td>
</tr>
<tr>
<td>Crosley and Dhamoon14</td>
<td>8</td>
<td>F</td>
<td>+</td>
<td>Inside of pencil sharpener</td>
<td>NS</td>
</tr>
<tr>
<td>Sacks15</td>
<td>NS*</td>
<td>F</td>
<td>+</td>
<td>Cigarette smoke</td>
<td>30 min to 24 hours</td>
</tr>
<tr>
<td>Diamond et al16</td>
<td>35</td>
<td>M</td>
<td>NS</td>
<td>Repulsive</td>
<td>5 min to 24 hours</td>
</tr>
<tr>
<td>Fuller and Guiloff</td>
<td>37</td>
<td>F</td>
<td>+</td>
<td>Unusual, unidentifiable</td>
<td>5 minutes</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>F</td>
<td>+</td>
<td>Peanut butter, grandfather's cigars</td>
<td></td>
</tr>
</tbody>
</table>

NS = not stated; NAD = no abnormality discovered; * = mother of eight-year-old.

1688
Migrainous olfactory hallucinations

ness and pain in the arm. Once an episode of headache was associated with a right hemiparesis. The headaches usually lasted 3 to 4 hours. On three occasions the headache had been preceded by vivid olfactory hallucinations, lasting 5 minutes, of either her grandfather's cigars or peanut butter. Her mother, her sister and both maternal grandparents suffered from migraine. Examination during one attack revealed an injected conjunctiva on the affected side and a mild left ptosis but no other abnormalities. EEG and CT scan were normal. The headaches responded acutely to ergotamine and cleared with propranolol.

Discussion

The headaches in all three patients satisfy published criteria for the diagnosis of migraine. In all three cases there is a clear temporal relationship between the olfactory hallucinations and the headache. The time course of the olfactory hallucinations is similar to other recognised phenomena associated with migraine attacks; most commonly visual scotoma, limb paraesthesiae and weakness. The progression of such phenomena is elegantly demonstrated by Lashley's drawings of his own enlarging scotoma.

It is unlikely that the olfactory hallucinations in our patients were associated with structural lesions in the temporal lobe in view of the lifelong duration of the attacks in cases 1 and 2, the lack of physical signs and the normal CT scans and EEGs. Case 1 had non-specific changes in her EEG similar to those previously described in association with migraine. In a review of EEGs performed in patients with migraine between 25% and 66% were abnormal. The original diagnosis in the first two cases was complex partial seizures. However, these attacks were migrainous rather than epileptic for three reasons. Firstly, the duration of the aura in epilepsy is shorter than in migraine, the former lasting seconds the latter generally longer than 5 minutes. In a study of complex partial seizures with video the mean duration of the whole seizure was 2 minutes, the aura comprising only a fraction of that time. In all three cases the smell lasted 5 minutes or more. Secondly, the headache in our case was migrainous. Epileptic headache is brief (seconds) and is followed by loss of consciousness or motor seizures. Headache following seizures is generalised and follows loss of consciousness. Thirdly, both the olfactory hallucinations and the headache responded to propranolol but not to carbamazepine.

A comparative summary of the five previously reported cases is given in the table.

Strong smells are recognised as trigger factors for migraine attacks. The vividness of the olfactory hallucinations described in migraine auras has led to a search for a source (see table). Some of the reported trigger smells may have been vivid olfactory hallucinations.

The pathogenesis of visual disturbances in migraine is uncertain. Whether the process is spreading depresion or hypoperfusion, the disturbances are generated by changes in the occipital lobe. The occurrence of olfactory hallucinations indicates involvement of the temporal lobe, and particularly the uncus, in this process. The three cases presented here, together with the five cited in the literature, illustrate that migraine should be considered in the differential diagnosis of a patient presenting with olfactory hallucinations.

References

5 Lashley KS. Patterns of cerebral integration indicated by scotomas of migraine, Arch Neurol Psychiatr 1941;46:331.
8 Fisher CM. Late life migraine accompaniments as a

<table>
<thead>
<tr>
<th>Onset</th>
<th>Laterised headache</th>
<th>Nausea or vomiting</th>
<th>Focal symptoms</th>
<th>CT scan</th>
<th>EEG</th>
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</thead>
<tbody>
<tr>
<td>NS NS</td>
<td>+</td>
<td>+</td>
<td>Visual scotomata</td>
<td>NAD</td>
<td>NAD</td>
</tr>
<tr>
<td>NS NS</td>
<td>+</td>
<td>+</td>
<td>Numbness</td>
<td>NAD</td>
<td>NAD</td>
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<tr>
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<td>+</td>
<td>+</td>
<td>None</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
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<td>+</td>
<td>+</td>
<td>Numbness</td>
<td>NAD</td>
<td>NAD</td>
</tr>
<tr>
<td>Sudden</td>
<td>+</td>
<td>+</td>
<td>Vertigo and tinnitus</td>
<td>NAD</td>
<td>See text</td>
</tr>
<tr>
<td>Sudden</td>
<td>+</td>
<td>+</td>
<td>Weakness, paraesthesia, limb pain</td>
<td>NAD</td>
<td>NAD</td>
</tr>
</tbody>
</table>