SHORT REPORT

Auditory hallucinations in Parkinson's disease

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Abstract

Whereas visual hallucinations are often found among patients with Parkinson's disease, the occurrence of auditory hallucinations has never been systematically documented. The occurrence, past and present, of auditory hallucinations has been studied in 121 consecutive patients with Parkinson's disease attending a movement disorders clinic. The cognitive state was evaluated using the short mental test (SMT).

Hallucinations were reported for 45 patients (37%); 35 (29%) had only visual hallucinations and 10 (8%) both visual and auditory hallucinations. No patient reported auditory hallucinations unaccompanied by visual hallucinations. The auditory hallucinations occurred repeatedly, consisting of human voices. They were non-imperative (n=9), non-paranoid (n=9), and often incomprehensible (n=5). They were not obviously influenced by the patients' age, duration of disease, or treatment with levodopa. Cognitive impairment was more common among hallucinating patients (64%, 50%, and 25% among patients with visual hallucinations, auditory hallucinations, and non-hallucinating parkinsonian patients respectively). Depression necessitating antidepressants was present in five of 10 and other psychotic features in six patients with auditory hallucinations.

It is concluded that auditory hallucinations occur in Parkinson's disease, particularly in patients who also have visual hallucinations and are cognitively impaired.

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The neuropsychological and psychiatric side effects in the treatment of Parkinson's disease have long been reported and remain a topic of interest.¹ Hallucinations are common side effects of dopaminergic drugs used in Parkinson's disease. They are usually visual and tend to appear as formed images on a background of clear sensorium. They are most likely to appear when the patient is drowsy or the ambient light dim. They are often characterised by experi-

ences from the patients' past and, less often, take the form of illusions.² After initial awkward experiences, patients often become accustomed to their presence and recognise them as unpleasant but not frightening perceptual aberrations,² although demented patients may lose their ability to identify these perceptual events as unreal. The presence of visual hallucinations may influence the physician's decision about the drug regime, its dosage, and administration during the day or nocturnally.

Whereas visual hallucinations are a well recognised problem in patients with Parkinson's disease on therapy, auditory hallucinations, which are less common, have not been the subject of a systematic study.

Patients and methods

The study cohort consisted of 121 consecutive patients with Parkinson's disease followed up by our movement disorders clinic, which is a tertiary referral centre. Patients underwent a mental evaluation using the short mental test (SMT). A value of 80% or lower was taken as evidence of cognitive impairment.³

A questionnaire was used which included items about the occurrence of visual or auditory hallucinations at present or in the past. When auditory hallucinations were reported, their context, the type of voice (human or not), the existence of imperative components, and whether they occurred during the daytime or were nocturnal, were carefully ascertained.

Results

Among 121 patients with Parkinson's disease, 45 (37%) reported having experienced hallucinations at present or within the preceding two years. Thirty five (29%) had only visual hallucinations, whereas 10 (8%) had both visual and auditory hallucinations. All patients with auditory hallucinations also reported visual hallucinations. The table summarises the demographic data of the three patient groups.

Patients with auditory hallucinations (10) reported hearing human voices talking outside their heads. Seven of them were hearing these voices at present, and three had experienced them in the past. The content was often incomprehensible (five), was non-imperative (nine), mood non-congruent (10), and non-paranoid (nine). In all cases, the voices were heard externally, speaking in the first or second person, but not arguing. They had no affective

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Demographic data of patients with and without hallucinations

	None	Visual only	Visual and auditory
n	76	35	10
Age (y)	74 (9)	74 (7)	74 (9)
SMT (%)	90 (9)	80 (3)*	80 (2)‡
Cognitively impaired (%)	25	64†	50
Duration of disease (y)	7 (6)	8 (4)	6 (5)
Time on levodopa (y)	4 (4)	7 (5)‡	6 (5)‡
Hoehn and Yahr stage (I/II/III)	2/23/51	0/8/27	0/0/10

Values in parentheses are SD.

The short mental scores (SMT) were lower in patients with visual (* $p < 0.001$) and auditory ($\ddagger 0.05 < p < 0.1$) hallucinations than in those without. The percentage of patients with cognitive impairment was significantly higher among those with visual hallucinations than among those without ($\dagger p < 0.01$). The duration of levodopa treatment was minimally longer in patients with hallucinations than in those without ($\ddagger 0.05 < p < 0.1$). The proportion of patients at stage III was minimally higher among patients with auditory hallucinations than among those without ($\ddagger 0.05 < p < 0.1$).

component. One patient reported a familiar, consistent, imperative voice, whereas two patients heard voices of familiar persons. For example, a patient identified the voice of her late husband, although she could not see him. He would comment about her daily activities and sometimes give her instructions, which she would occasionally follow. Another patient reported hearing voices which she thought were generated outside her room, possibly coming over the radio. She later acknowledged that they probably originated in her mind. Voices would discuss various topics and would not comment on her actions. She sometimes felt the need to respond to them.

As mentioned above, all patients who experienced auditory hallucinations reported visual hallucinations as well. However, no relation existed between visual and auditory hallucinations. The visual images never spoke or generated noises. The voices were never accompanied by an image; they occurred at different times and their respective context was unrelated.

During the period of occurrence of auditory hallucinations, four patients were confused, and another also had paranoid thoughts. No patients experienced Schneiderian first rank symptoms—namely, no patients heard their thoughts spoken aloud, none felt that their thoughts or actions were controlled from outside, nor heard comments on their behaviour. None had somatic hallucinations.

Only one patient volunteered information about the presence of auditory hallucinations, and the rest reported their existence only when challenged directly. One patient reported that he always knew that the voices were imaginary, whereas others often thought them to be real. When asked why they did not report this phenomenon to their physicians, they expressed some embarrassment about revealing that they had been hearing voices.

All 10 patients with auditory hallucinations were being treated with levodopa with or without the dopamine agonists selegiline or amantadine. The daily levodopa dose varied from 187.5 mg to 500 mg (with carbidopa). Four patients experienced motor fluctuations, three in the form of “on-off”, and one had “end of dose bradykinesia”. One patient reported hearing voices more often during “off”. In the remaining patients, no apparent correlation

between the motor state and hallucinations could be determined. Five patients were depressed and treated with amitriptyline (three), fluvoxamine (one), or trazodone (one). None had had a psychiatric history before the onset of Parkinson's disease; six had experienced psychotic episodes expressed by paranoid thoughts, confusion, and hallucinations under antiparkinsonian medication. Clozapine caused the disappearance of auditory hallucinations in three patients out of five who received the medication. In one patient, auditory hallucinations disappeared when amantadine was stopped, and diminished in amount in another patient after the discontinuation of selegiline.

Patients with hallucinations had more cognitive impairment than those without (mean (SD) SMT scores were 80 (3)% for visual hallucinations only, 80 (2)% for auditory hallucinations, and 90 (9)% for non-hallucinating patients with Parkinson's disease; table). The proportion of cognitively impaired patients was higher among patients with visual hallucinations (64%) or auditory hallucinations (50%) than among those without hallucinations (25%).

Discussion

Our findings suggest that auditory hallucinations are not rare among treated patients with Parkinson's disease. On the contrary, a quarter of patients who experience visual hallucinations also reported auditory hallucinations. We did not find in the literature any systematic report of auditory hallucinations in Parkinson's disease; a vast recent review of psychiatric side effects of antiparkinsonian medication which focused on hallucinations did not describe auditory hallucinations.¹ In daily practice, many neurologists may not consider auditory hallucinations as a common side effect of antiparkinsonian medication. The existence of auditory hallucinations among treated patients with Parkinson's disease was, however, mentioned in the early days of levodopa, by Moscovitz *et al.*² This study reported that 29.5% of 88 patients with Parkinson's disease experienced hallucinations and 5.7% experienced illusions. Among the hallucinating patients, 9.7% had pure auditory hallucinations, 61.3% pure visual, and 25.8% visual plus auditory ones.² Thus, in this series also, visual hallucinations were more common than auditory hallucinations, whereas auditory hallucinations usually occurred on the background of visual hallucinations. A recent study reported a relation between the “off” period and the occurrence of hallucinations, including auditory hallucinations.⁴ Most of our patients were unable to determine such a relation. It is possible that the paucity of reports about auditory hallucinations in the literature derives from the fact that patients would often refrain from mentioning them spontaneously and that they were not specifically asked about them.

Hallucinations at present or in the past occurred in 37% of our patients. This figure is reminiscent of those found in studies about psychiatric side effects of antiparkinsonian

treatment,^{2,5} but could also reflect that we serve as a tertiary referral centre for more complicated cases. For visual hallucinations, older age and dementia are known risk factors.^{5,6} We found that, whereas age did not seem to be of particular influence for auditory hallucinations among our patients, advanced motor disability and cognitive impairment are possible risk factors (table), although patients with auditory hallucinations were only mildly impaired and some were mentally intact. Formed hallucinations such as musical hallucinations can occur in patients with hearing loss⁷ but among our patients with auditory hallucinations only one had a hearing deficit, which was mild.

As all our patients were elderly and had had Parkinson's disease for several years, and all were treated with levodopa, we cannot prove that the patients' symptoms were related to drugs. However, it is notable that in several cases clozapine was able to stop the hallucinations even at the relatively low dose used in Parkinson's disease.⁸ Mechanisms by which levodopa can induce psychosis include stimulation of dopamine receptors located preferentially in limbic structures.⁹ It is also possible that serotonin in the mesolimbic and mesocortical systems plays a part in inducing hallucinations, as it has been reported that the specific 5HT₃ antagonist ondansetron can alleviate levodopa induced visual hallucinations.¹⁰

The neurologist treating patients with Parkinson's disease takes into account the motor status and the clarity by which the patient distinguishes hallucinations from reality, when

deciding whether to decrease the daily amount of medication or to add an antipsychotic drug.⁸ We propose that inquiring about auditory hallucinations should be included in the routine investigation of patients with Parkinson's disease, as information about this phenomenon might not reach the physician's attention unless specifically sought. Although the discontinuation of some antiparkinsonian medication in some cases may lead to the disappearance of auditory hallucinations, further systematic studies for other treatments for auditory hallucinations are indicated.

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