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Visual complaints and visual hallucinations in Parkinson's disease

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ABSTRACT

Background: Visual symptoms are common in Parkinson's disease (PD) and are frequently underdiagnosed. The detection of visual symptoms is important for differential diagnosis and patient management.
Aim: To establish the prevalence of recurrent visual complaints (RVC) and recurrent visual hallucinations (RVH) and to investigate their interaction in PD patients and controls.
Methods: This cross-sectional study included 88 PD patients and 90 controls. RVC and RVH were assessed with a visual symptom questionnaire and the North-East-Visual-Hallucinations-Interview (NEVHI).
Results: Double vision (PD vs. Controls: 18.2% vs. 1.3%; $p < 0.001$), misjudging objects when walking (PD vs. Controls: 12.5% vs. 1.3%; $p < 0.01$), words moving whilst reading (PD vs. Controls: 17.0% vs. 1.3%; $p < 0.001$) and freezing in narrow spaces (PD vs. Controls: 30.7% vs. 0%; $p < 0.001$) were almost exclusively found in PD patients. The same was true for recurrent complex visual hallucinations and illusions (PD vs. Controls: both 17.0% vs. 0%; $p < 0.001$). Multiple RVC (43.2% vs. 15.8%) and multiple RVH (29.5% vs. 5.6%) were also more common in PD patients (both $p < 0.001$). RVC did not predict recurrent complex visual hallucinations; but double vision ($p = 0.018$, $R^2 = 0.302$) and misjudging objects ($p = 0.002$, $R^2 = 0.302$) predicted passage hallucinations. Misjudging objects also predicted the feeling of presence ($p = 0.010$, $R^2 = 0.321$).
Conclusions: Multiple and recurrent visual symptoms are common in PD. RVC emerged as risk factors predictive of the minor forms of hallucinations, but not recurrent complex visual hallucinations.

1. Introduction

Patients with Parkinson's disease (PD) often report vague and ill-defined visual complaints, including dry eyes, photophobia, diplopia, difficulties with reading, difficulties estimating spatial relations, e.g. misjudging objects when walking or freezing in narrow spaces [1–3] as well as striking visual hallucinations [1,3–6]. Reduced blink rate and difficulties with eye movements may contribute to visual complaints [2,3]. Visual hallucinations have been associated with increased age [1]; impaired visual acuity [1,7], impaired contrast sensitivity or color vision [8], visuo-perceptual impairment [9] and cognitive impairment or dementia [1]. Visual symptoms in PD become more common as the disease progresses [6,10]. The prevalence of complaints in PD ranges from 10 to 70% [2] and prevalence for hallucinations ranges from 6 to 87% [1,4–6,10,11]. The interaction between complaints and hallucinations is poorly understood.

Recurrent visual hallucinations (RVH) are a diagnostic feature of Parkinson's disease dementia (PDD) [12] and they are helpful when discriminating PDD from other neurodegenerative disorders with extrapyramidal features [5]. They may signify disease progression and their identification is, therefore, important for both differential diagnosis and prognosis. Visual symptoms are underreported by patients unless proactively assessed by health professionals [5,11,13]. There is no gold standard for how to assess visual hallucinations in PD [13] and most existing questionnaires [14,15] rely on informant information and do not consider the phenomenology in detail. We used the North-East-Visual-Hallucinations-Interview (NEVHI) and a visual complaints questionnaire to assess the phenomenology of visual symptoms in PD patients [1,10,13], to

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establish the interaction between RVC and RVH, and to assess whether all symptoms are related to PD or if they can also be found in healthy older adults. Furthermore, we wanted to establish the emotions, behaviors and cognitions associated with RVH.

2. Methods

2.1. Subject recruitment

This cross-sectional study was approved by the National Health Service (NHS) Local Research Ethics Committee. All procedures related to the study were fully explained to participants and written informed consent was obtained prior to participation.

Community based PD patients were approached via the movement disorder outpatient services of Newcastle upon Tyne Hospitals Trust and Gateshead Health NHS Trust (UK). A total of 90 consecutive patients (≥50 years) were included. PD was diagnosed by experienced consultant neurologists specialized in movement disorders according to the UK PD Society Brain Bank Clinical Diagnostic Criteria.

The controls (≥50 years) were recruited via advertisement, e.g. in the Newcastle Elders magazine and in a local church. Of the 92 controls approached, 90 were included. Most patients and controls were assessed at home.

2.2. Exclusion criteria

Controls were excluded if they had a history of an unstable medical condition or a diagnosis of PD. Exclusion criteria for all participants were a history of age related eye disease (i.e. macular degeneration), a diagnosis of dementia, communication difficulties and significant hearing loss. Two controls were excluded due to macular degeneration and 2 PD patients had a clinical diagnosis of Parkinson's disease Dementia (PDD). They were all excluded from the study.

2.3. Clinical evaluation/diagnostic procedures

Demographic data, the medical, neurological and ophthalmological history were assessed in a semi-structured interview. Binocular best visual acuity at presentation, expressed in decimals (i.e. 1.0 vision = 100% vision; equals to 6/6 vision), was examined at a test distance of 40 cm [16]. Cognition was assessed using the Mini Mental State Examination (MMSE) [17]. The verbal fluency (FAS test) and category fluency test were used to assess executive and language skills [18]. PD medication dosage was expressed as levodopa (L-dopa) equivalent dose (LED) [19]. The severity of motor features and the impairment in activities of daily living (ADL) were assessed using the Unified Parkinson's disease rating scale (UPDRS) part II and part III, respectively [14]. The Parkinson's disease Quality of Life (PDQ-8) was used to evaluate health related quality of life [20]. The Epworth Sleepiness scale (ESS) was used to assess daytime sleepiness [21]. The Mayo sleep questionnaire [22] was used to determine the presence of rapid eye movement (REM) sleep behavior disorder (RBD) symptoms. All participants filled in the Beck Depression Inventory (BDI) [23], a self-rating for depression.

2.4. Recurrent visual complaints and visual hallucinations

RVC were assessed with a questionnaire derived from the 25-item National Eye Institute Visual Function Questionnaire (NEIVFQ) [24]. This inquires about the presence and persistence of the following complaints: painful/dry eyes; blurred vision; sensitivity to light; double vision; difficulty with reading as letters/words appear to move; misjudging objects when walking; freezing in narrow spaces, such as doorways.

The NEVHI [13] was used to screen for different visual hallucination phenomena, including frequency and severity. Section 1 screens for the presence and phenomenology of visual hallucinations (simple and complex visual hallucinations, visual illusions, passage of shadows, feeling of presence). Simple hallucinations refer to flashes, dots, lines, shapes, swirly and pattern like grids or tiles [25]. Complex visual hallucinations consist of formed images, e.g. figures, objects, animals and forms [26]. Feeling of presence (also extracampine hallucinations) is the feeling of a person being present in the room or house, usually outside the field of view [27]. Section 2 establishes the duration and frequency of hallucinations; and Section 3 assesses other perceptions, emotions, cognitions and behaviors associated with visual hallucinations. All participants completed Section 1. Participants with visual hallucinations were assessed with Section 2, while Section 3 was applied to participants with RVH in the month prior to the assessment. The interview lasted between 2 and 10 min. RVC or RVH referred to symptoms persisting or occurring more than once during the month prior to the assessment. Multiple visual symptoms referred to ≥2 RVC and/or ≥2 RVH in the month prior to the assessment.

2.5. Statistical analysis

The Statistical Package for Social Sciences (SPSS Version 20) was used for data management and processing. The distribution of data was examined for normality using Kolmogorov–Smirnov test. Means and standard deviations (SD) were calculated. Normally distributed data were analyzed using parametric (independent sample *t*-tests), all others with non-parametric tests (Mann–Whitney tests). The Chi-square test was used for the comparison of frequencies and Fisher's exact test when expected frequency in either group was <5. The demographics and visual symptoms were compared between PD and controls. Patient characteristics were also compared in patients with and without hallucinations (RVH+/RVH−), in PD with RVC only (RVC+/RVH−) and in patients with RVC and RVH (RVC+/RVH+). The PD patients with RVC were dichotomized into Complex+/Complex−, Illusion+/Illusion−, Passage+/Passage-, Presence+/Presence− and Simple+/Simple− groups. Stepwise logistic regression with adjustment for cognitive impairment was used to ascertain whether prevalence of RVC in PD could predict the presence of RVH. The goodness of fit of the regression model was tested using Hosmer and Lemeshow test. All reported *p*-values are two-tailed and a $p < 0.05$ was considered a significant difference.

3. Results

3.1. Demographics

The demographics of PD patients and controls are summarized in Table 1. There was no difference between PD patients and controls with regards to age, gender, education or visual acuity. PD patients had slightly more cognitive impairments than controls, they also had more excessive daytime sleepiness, a higher frequency of REM-Sleep behavior disorder and depressive features.

3.2. Recurrent visual complaints and visual hallucinations

The prevalence and phenomenology of RVC and RVH is summarized in Table 2. Most RVC, except painful/dry eyes were more prevalent in PD patients than in controls. Interestingly, visual floaters were more common in controls than in PD patients. The complaints of freezing in narrow spaces, double vision, misjudging

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