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Presentation and Interpretation of Neurocognitive Deficits of a Young Female Patient With Parkinson's Disease

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1. Abstract

In Cognitive Neuropsychology, data from case studies are used to create models, to draw conclusions about the functional characteristics of normal intellect, and to explore deficient and intact mental abilities. The results of case studies have become equally reliable data through which a theory is supported or not. Parkinson's disease is one of the most common neurodegenerative diseases with an average incidence of about 200 / 100,000. The frequency depends on age, as up to the age of 40 it does not exceed 3-4 / 100,000 while from the age of 70 onwards it exceeds 50 / 100,000. The present study examines the cognitive deficits of a 42-year-old woman diagnosed with Parkinson's disease.

1.1. Aim: To describe the cognitive deficits of a young woman with Parkinson's disease. The clinical picture, laboratory findings, pathogenesis and the neuropsychological assessment process are discussed. At the same time, the relevant literature is reviewed.

1.2. Results: Disorders in image design and line orientation were observed and a decrease in visual attention and spatial perception. The patient also had a functional or working memory disorder resulting in difficulty concentrating and spontaneously retaining a series of procedural sequences to perform specific tasks, which reflects possible underlying prefrontal dysfunction.

1.3. Conclusions: There are cases of patients with Parkinson's disease who present with mild cognitive impairment. This patient seemed to have developed effective replenishment and adaptation strategies, her deficits mainly concerning executive functions, visual-spatial functions, memory and speech. Parkinson's disease is associated with a variety of cognitive impairments even in the early stages, and these cognitive deficits may not be apparent and can only be detected by appropriate neuropsychological tests. The deficits are mainly related to the insufficient use of the memory stores and the manifestation of a "dysfunctional" syndrome. This evolving "syndrome" concerns memory disorders and accompanying various disorders in executive functions, visual-spatial functions and speech, without the presence of aphasia, ignorance, or inactivity.

2. Parkinson's Disease

Parkinson's disease is a progressive neurodegenerative disorder associated with dysfunction or loss of dopaminergic neurons in the brain, lack of dopamine, and the formation of abnormal Lewy Bodies protein particles in neurons. It is an idiopathic disease of the nervous system, characterized by motor and non-motor manifestations. The disease has been described since 1817 by James Parkinson. It is associated with significant disability and low quality of life.

3. Predisposing Factors

Age is one of the most important risk factors, although 10% of people with the disease are under 45 years old. Other risk factors include a family history of Parkinson's disease, exposure to pesticides and other environmental factors. According to some studies, non-smokers are twice as likely to develop the disease, as post-menopausal women and men who consume low levels of caffeine

appear to have an increased risk of developing the disease.

4. Clinical Picture

Parkinson's disease is clinically characterized by restlessness, hypertension, immobility, and disturbances in posture and balance. The early symptoms of the disease are difficult to perceive, the disease worsens relatively slowly, and many times, the diagnosis is delayed 2-3 years from the first symptoms. The first perceived manifestations are tremor of calm, in 70% of cases, loss of skills of one hand, slowness and stiffness. The point of the cog in the examination of the carpus joint is also characteristic. In later stages, the patient's face is expressionless and the speech is monotonous with dysarthria. The gait is done in small steps, the torso is curved, the arms are fixed on the sides, with a crawling gait, but usually at an accelerated pace. All the movements that require skill, such as food, clothing, bathing, are done very slowly and often require help. These patients have an increased risk of developing dementia, but also other mental disorders, anxiety and emotional.

4.1. Typical Attention Deficit in Parkinson's Disease

Regarding the ability to pay attention, as calculated by the number memory test, most studies have found that performance is generally within normal limits [1, 2]. Attention deficits are common in patients with Parkinson's disease and are more common in complex trials requiring alternating or maintaining attention [3, 4, 5] and in mental calculations require constant mental monitoring [2, 6]. The short-term memory tested by the three-pact test is intact, with delays of up to 15 seconds, except when intermittent interventions (Brown-Peterson technique) are introduced, turning it into a working memory test and then the patient recall rate is reduced below that of controls [7]. Bowen (1976) [8] observed that these patients could perform mental observation tests, 'but were reckless with their mistakes'. The variation in cognitive status in the Parkinson's group of patients may explain some contradictory findings, such as that in many attention trials, especially timed ones, the average of the Parkinson's group falls significantly below the normal age group or martyr ratings. [9](Mahurin, Feheretal., 1993), but the relatively large standard deviations that reflect differences between individuals alter the generally pathological condition of Parkinson's patients [10-12]. Large standard deviations should be expected when patients with bradykinesia and tremor are included in the research sample, as bradykinesia is significantly related to reaction times, but tremor is not [9].

4.2. Memory Disorders in Parkinson's Disease

In Parkinson's disease there is a persistent pattern of memory and learning disorders. Short-term retrieval of a list of words or stories is likely to be disrupted. Delay can enhance short-term recall, a phenomenon typically seen in delayed processing. Recall to unrelated verbal material is also disrupted and often contains an abnormal number of intrusions, conceptually or phonetically related words. In assisted recall, these patients tend to perform within normal limits, either with help given through suggestion, such as pair-related learning, or in the form of recognition. Some studies [13, 14] found no improvement in suggestion. Patients with Parkinson's benefit from learning strategies, such as categorizing stimuli, but have difficulty initiating these strategies [1]. Sequencing and other serial requirements significantly increase the difficulty of learning tests in patients with NP [15]. Patients with Parkinson's disease perform poorly on visual memory as it requires a motor response. But when examined in the form of reading, visual learning is intact. Both spatial and pattern recognition have also been shown to be deficient [16, 17], but to a much lesser extent when there are longer lag intervals, yet spatial learning remains intact. Inadequate short-term recall in visually presented stimuli has been observed [7]. Procedural memory-learning skills may be affected. Some researchers [18] (Haal & Harrington, 1990) found that the degree of attenuation was related to the severity of the disease, others [19] (Heindel, Salmon, Shults, 1989) reported that procedural learning disorders occurred only in patients with clear cognitive deficits, while others [20] found it normal to learn skills in NP patients with or without dementia. The above facts, which are quite contradictory, raise questions about the choice of individuals, in a situation with such a wide variety of symptoms. Long-term recall, whether semantic or visual, also tends to be weakened. Despite the high incidence of depression in Parkinson's disease, it does not appear to contribute to poor memory performance [21].

4.3. Typical Language Deficits in Parkinson's Disease

Vocabulary, grammar and syntax remain virtually intact in Parkinson's disease, although both sentence length and overall output tend to be reduced. However, speech disorders, primarily related to finding and retrieving words, are common. Thus these patients tend to perform poorly in verbal proficiency tests. If they produce more words for semantic categories e.g. animals, fruits, than they produce by simple correlations of the first letter. Also weakened is the nomenclature which arises later from the other verbal dysfunctions, in particular the lack of verbal fluency. Patients with Parkinson's disease are particularly distinguished by stimulus dysarthria, a disorder of the mechanical aspects of speech. This manifests itself as dysarthria, with a loss of melodic tone, resulting in a monotonous quality of speech, low volume and variety in production speed, so that words come out hurriedly once and very slowly at other times. The writing acquires a spasmodic, sharp appearance and can be greatly reduced in size, miniature. Finally, oral reading slows down [21].

4.4. Deficiencies in Visual-Spatial Functions in Parkinson's Disease

Visual-spatial disorders have often been described in patients with Parkinson's [1, 22, 23]. Deficiencies have been reported in the perceptual crisis that requires matching, synthesizing, and orienting

angles, both in design copy and in free design, where the size of human figures is reduced [24] and deficits in both personal and extra-personal orientations with the exception of the ambiguous findings for left and right orientation [1]. These patients have difficulty with the WIS-A Individual Cube Design and Object Assignment tests [25]. Disorders in Design Using Cubes and Visual-Spatial Orientation Deficiencies are significantly associated with dementia and disease duration [26, 27]. Mortimer, Pirozzolo et al. (1982) [28] found that good performance in visual-spatial tests was associated with tremor while poor bradykinesia. Cummings and Huber (1992) [22] also observed these differences in visual-spatial tests. They suggest that a general development of visual-spatial deficits occurs, beginning with a disturbance in the orientation of the bar early in the course of the disease. Deficient line orientation and failure in Cube Design and Image Layout occur in the middle stage of the disease. Face recognition is affected in the later stages of Parkinson's disease. Hovestadt and colleagues (1987) believe that the problem of spatial disorientation is indisputable and occurs early and regardless of the duration or severity of the disease, the patient's age, drug effects, and verbal skills.

Most studies [29, 3]. Weighed or described the motor disturbances before the visual-spatial deficits were reported. The nature of these problems has been challenged by a number of studies have concluded that visual-spatial functions are not severely impaired in Parkinson's patients [26] , at least in those whose left ventricular problems do not predominate. What you present as a visual-spatial disorder may rather be better understood in the context of executive dysfunctions. Duplication and revocation of designs by the Rey-Osterrieth Complex Scheme was poorly organized with significant omissions, deficits that involved executive malfunctions. However, both visual and motor deficits also contributed to poor performance, leading to the conclusion that "visual-structural disorders in NP are multi factorial in nature" [30, 21].

4.5. Characteristic Deficits of Executive Functions in Parkinson's Disease

The features of thinking, such as reasoning, problem solving, judgment, and conceptual formation, can be separated and clearly disconnected from executive functions, but Parkinson's patients consistently fail trials involving both conceptual and executive functions. Tests that require both concept formation and displacement cause poor performance in most Parkinson's patients: e.g., Raven Progressive Matrices [10, 12], the Wiscon Card Classification Test [8, 31, 6] and the Category Test [32]. These patients, when they have to formulate a strategy for the first time, usually make mistakes, but as soon as they consolidate a series of solutions, they perform close to normal levels [33]. Both cognitive flexibility and maintaining a range are difficult [8] (Bowen, 1976; Gronin-Golumb, 1990), but cognitive flexibility problems can pre-

dominate [34]. Frequent problems with self-control (Girottietal., 1988) and self-correction were attributed to cognitive flexibility [8](Bowen, 1976) or failure to initiate the changes that were perceived to be necessary [35]. Patients with Parkinson's have constant difficulty adapting to modernity, regardless of how they present themselves [36, 37]. Slowing responses can also contribute to executive deficits [1, 6]. The inability to organize perceptions in a practical way (what Ogden and his colleagues call "front-end design", a problem that manifests itself as a sequence deficit when these patients are asked to organize stories with images in sequences, e.g. The WIS-A Image Layout test is another aspect of dysfunction that is detected in patients with Parkinson's [38, 35, 7]. Some researchers have suggested that all of these deficits may be due to deficient behavioral regulation resulting from a central programming disorder [1, 18]. More recently, Harrington and Haal (1991b) have suggested that visual impairments and poor cognitive flexibility may also contribute to impaired motor regulation in these patients. However, the design in the Tower of London test, or in the somewhat more demanding Toronto Tower test, is evolving slowly, but is likely to remain intact [39, 33].

4.6. Neuropsychological Assessment in Parkinson's Disease

Programming ability is tested with Word fluency task tests and spatial sequences generation task. Resistance to interference in patients with Parkinson's disease is tested with dual-task paradigm the WCST (Wisconcin Card Sorting Test). The WCST test is widely used to test executive function, even in healthy ones to test the ability to organize a strategy that requires mental flexibility (ability to switch tasks). The WCST does not look at a single anatomical area of the brain but at different anatomical structures where the frontal lobe plays a dominant role. Thus the WCST is the "complex controller" of the executive function and not a specialized frontal lobe control test. Patients with Parkinson's disease show reduced performance in the following WCST categories: total effort, persistent responses, persistent responses, and failure to complete a category. The last three categories are related to patients' motor performance. Stiffness is strongly associated with obsessive responses and the rate of obsessive responses. The poor performance of Parkinson's in the WCST test is related to the progression of the disease. The neuropsychological test Odd Man Out tests the mental flexibility to move on to a new activity. The difficulty that patients with Parkinson's disease experience with this ability is due to their inability to inhibit competitive responses, and the external dorsal frontal lobe is responsible for this. An extensive neuropsychological investigation of cognitive abilities and in particular of executive function includes assessment of guided learning which is tested with the pet rides Conditional Associate Learning Test. while the Verbal Fluency Test examines the ability to create and alternate words

5. Case Study

The patient is 42 years old, unemployed and with twelve years of education. She lives with her doubter. Reported onset of symptoms from the age of 39. Worsening of symptoms has been reported for two years. Specifically, he presented with trembling of the upper extremities of the hands, which worsens with fatigue and stress. The trembling of the hands worsened over time. Her family history is free of neurological diseases. When she was admitted to the hospital, she presented with postural tremor and kinetic tremor, mainly in the upper extremities, mild voice tremor and her movement was slow and dystonic. Tendon reflexes were released normally. Brain junctions, muscle tone and muscle strength were normal. As part of the organic investigation of the causes of terror, a complete hematological, biochemical and metabolic test was performed. Thyroid function, blood catecholamine, urine, auto antibodies and antibodies for congenital infections were tested. The test results were normal. On brain MRI, areas of abnormal intensity were observed in the basal ganglia. The imaging of the cerebellum was normal. No medication was reported to cause tremor or withdrawal syndrome.

5.1. Results of the Neuropsychological Assessment of the Patient

The main goal of the patient's neuropsychological assessment was to investigate possible cognitive deficits. Specifically assessed: levels of attention and concentration, visual perception, learning ability, parameters of memory (verbal, visual, working, long-term), verbal functions and academic skills, visual-spatial and visual-constructive ability, abstract thinking, information processing speed, ability to form concepts, and executive functions. From the patient's history did not arise in the first year the need to exceed the basic set of assessment of cognitive abilities and add specialized tests. Neuropsychological examination focused on memory function (Story memory, reverse number retrieval, verbal flow test), attention (stroop, direct number retrieval, TMT), and executive functions (Trail Maiking Test, cube test, anoi tower, visual test). Her score on both immediate and long-term memory tests (story memory, reverse number retrieval, verbal flow test) appeared deficient for her age and cognitive level. Regarding the long-term retention at the specific time of the evaluation, difficulties were observed in the tests that allow the conceptual organization of the data to be memorized (memory of stories). The maintenance of mnemonic traces concerning general knowledge (declarative memory) ranged at normal levels. The patient's attention span fluctuated at very low levels as indicated by the slow execution of the AD part of the Trail Maiking Test but also by its performance in the Stroop interpolation condition. In general, the patient's performance in information processing speed, learning, memory, and executive function ranged below normal for her age and level of education at that time. In particular, the patient showed reduced accuracy and speed of rotation of visual attention to a different type of reaction, difficulty in abstract thinking and parallel processing of information according to its performance in the individual tests of the neuropsychological array. The patient showed that she maintains at normal levels the ability to perform daily activities as well as to assess/control reality.

6. Conclusions

The memory disorders in the case of this patient are relatively mild, the recall through an indicative element (cued recall: special indicative data are given in order to help the recall, ie the rendering of the memorized information) or with assisted learning tasks shows that it helped. It mainly presented a disturbance of the functional or working or working memory, resulting in the difficulty of gathering and spontaneous memory retention of a series of procedural sequences for the execution of specific tasks, which reflects an underlying prefrontal dysfunction. The aforementioned deficits appear to be associated with a lower degree of short-term recall or immediate memory as well as with psychomotor retardation, as well as with difficulty obtaining new information and learning new material without clear evidence of precursor amnesia. Disorders in image design and line orientation and impaired visual and spatial perception, difficulty concentrating, and disturbances in the temporal organization and regulation of new information and the placement of events in the correct chronological order were observed. However, the processes of storage and consolidation, which are under the control of the temporal lobes, remain intact. Finally, there was a limitation of eloquence and difficulty in naming, deficits in the length of the sentences, the prosody and the informative content of the spontaneous speech. In general, the patient's cognitive impairments are mild while presenting effective replenishment and adjustment strategies.

Parkinson's disease is associated with a variety of cognitive disorders even from the early stages. These cognitive deficits may not be obvious and can only be detected by appropriate neuropsychological tests. They are mainly related to the insufficient use of the memory stores and the manifestation of a "dysfunctional" syndrome. Cognitive disorders in Parkinson's disease are usually characterized by an evolving "dysfunctional syndrome", with memory impairments and accompanying a variety of disorders in executive functions, visual-spatial functions and speech, without the presence of aphasia, ignorance, or inactivity.

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