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PARKINSON'S DISEASE. VISUOPERCEPTIVE DISABILITIES & COGNITIVE DEFICITS

BY

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Abstract

Visuoperceptive disabilities in twenty right-handed patients with idiopathic parkinson's disease(PD) were tested. No significant difference was found in the patients using the WAIS performance subtest. Although insignificant, yet individual scoring of patients with PD showed that there is difficulties in visual motor coordination and performance conceptualization. These difficulties might underline the mental rigidity and inflexibility of PD.

Introduction

A wide range of congnitive deficits have been reported in parkinson's disease (PD) using a battery of different neuropsychological tests on large numbers of unselected patients (Pollock and Hornabrook, 1966, Warburton, 1967, and Loranger et al., 1972). visuoperceptive and spatial analysis deficits are probably the most important neuropsychological disabilities. The latter two deficits, amongest other things, are thought to be responsible for a decline in spatial orientation performance and visual memory (Horn, 1974). The possible correlation between visual perception abnormalities and varying degrees of mental deterioration are still obscure. Using Wechsler Adult Intelligence Scale (WAIS),Lees and Eileen (1983), found no impairment

of general intellectual function and stated that, all the difficulties noticed in patients with PD are intermittent and may be corrected temporarily by will power on the patients part or by external exhortation. Mathews and Haaland (1979), agree with these findings, while Loranger et al.(1972), and Gil & Lefevre (1979), noticed low scores of parkinsonians in the visuo-spatial tests in contrast to the normal scores reached in verbal tests.

This study is undertaken to assess the possible incidence and degree of visuo-perceptive deficits in Egyptian patients with idiopathic PD. and if these deficits are present are they attributed to cognitive abnormalities or not?

Patients and Methods

The investigation was conducted on a group of twenty patients with idiopathic PD. providing the following criteria; 1-Below the age of 60 years 2-predominantly right-handed 3-no evidence of psychiatric history 4-no exposure to antiparkinsonian medications and if present they are discontinued 48 hours prior to neuropsychological examination 5-all the patients were examined by the same investigator. The side of greater involvement was recorded and a symmetry was determined by history and physical examination. Of the three cardinal features, tremor, rigidity, and bradykinesia, the latter was the most salient pointer in determining the side of greater disease involvement(Direrfeld et al., 1984).

The twenty patients comprised 9 males (mean: age 55.3 years) and 11 females (mean: age 51.8). The mean duration of disease from first symptom was 3.6 years (rang 2 weeks to 20 years) below 1 year (9 patients), from 1-5 year (9 patients), one 12 and another 20 years.

In those patients with predominantly unilateral disease, (17 patients), 11 had mainly right-sided disabilities and 6 left-sided. The disease is bilateral in 3 patients. Seven patients were educated and 13 illiterate.

Twenty age-matched controls were chosen from hospital inpatients without brain damage or clinical

signs of mental diseases. They were of the same sex, education and sociocultural status as the group of PD.

The neuropsychological battery sampled functions from three major domains:

1. Visuospatial ability.
2. Memory.
3. Mental control.

(I) Visuospatial functions:

Wecshler Bellvue scale (WBS) (Melika, 1983), with referal to performance subtests.

[1] Digit symbol: This subtest can evaluate persistance motor sustained attention, response speed and visuo-motor coordination.

[2] Picture completion: it is used to assess the perceptual memory.

[3] Block Design: It measures spatial visuo-organization and performance conceptualization.

[4] Picture arrangement: This test measures sequential thinking.

(II) Mental control

[1] Mini-mental state examination (MMS) (Eolstein et al., 1975). It measures orientation, registration, attention and calculation and recall.

[2] Wechsler Digit span subtests: This test (digits forward and digits backward) measures immediate memory span plus the ability to store a few data bits briefly and at the same time juggle them around mentally. Digit forward measures focused attention which is presumed to be a precursor of mental control.

(III) **Memory**

[1] Wechsler picture completion test for assessing the remote memory.

[2] Wechsler Digit Span test for measuring the immediate memory.

Results

The patients and controls did not differ significantly (P>0.05) in their performance on the WAIS subtest both for visuo-spatial deficits and memory (Table, I, II).

Patients with right sided PD score significantly lower (P<0.05) than with left sided PD on WBS block design (right side:mean=5.8, left: mean = 8.7) and Digit symbol subtest (right: M=4.3 left:M=6).

Also Mini-mental state examination failed to reveal any significant difference between parkinsonian patients and the control group (Table III).

Table (I) Results of the patients group on WBS

Subtest	M ± SD	Range
Digit span	6.2 ± 1.8	2.0 – 9.0
Block design	6.6 ± 2.3	4.0 -11.0
Picture completion	7.5 ± 2.9	4.0 -14.0
Digit symbol	5.3 ± 1.5	3.0 – 8.0
Picture arrangement	6.5 ± 2.8	3.0 -12.0
Performance IQ	88.8 ± 16.8	

Table (II) Results of the control group on WBS

Subtest	M ± SD
Digit span	7.6 ± 2.3
Block design	6.5 ± 1.8
Picture completion	8.4 ± 2.5
Digit symbol	6.7 ± 2.2
Picture arrangement	6.8 ± 1.6
Performance IQ	92.1 ± 15.8

Table (III): Results on mini-mental state examination M. values.

	Patients	Control
Orientation	9.5	9.8
Registration	3.0	3.0
Attention and calculation	3.9	4.3
Recall	2.5	2.8

Discussion

Some supportive data indicating that, the basal ganglia may not just be involved in sensorimotor intergration come from the few comparable studies in man. Difficulties with object naming, striking fluctuations of verbal fluency and perseveration occur after left sided ventral thalamic stimulation. Right sided stimulation, on the other hand, affects the discrimination and recognition of complex visual patterns (Fedio and Van Buren, 1975). Bower, (1976) noticed that patients with bilateral or left-sided parkinson's disease did badly on route walking tests which may suggest that non apparent difficulties in visuospatial orientation were present, yet he stated that impaired motor performance was not considered an adequate explanation for these disturbances and no direct correlation with motor disability was detected. There are considerable problems in assessing the relevance of experimental studies on the role of the basal ganglia on visuospatial abilities on animals to normal human behaviour.

It has long been known that the right cerebral hemisphere is important in visuospatial relationships (Sandra and Marsel, 1983). Accordingly Damasio et al.(1980), stated that, due to the interconnections between the frontal lobes and the basal ganglia, lesions of the latter can induce significant perceptive, spatial and motor behaviour deficits both in animals and in man. However, we need more work on the neurological basis of social competence to prove or disprove these data.

Various complex relationships between the clinical features of the disease and the neuropsychological deficits have been reported (Levita et al., 1964). Tremor and rigidity have been found to be positively correlated with neuropsychological deficits in some studies, (Levita et al., 1964 and Marttilla & Rinne, 1976), but not in others (Lieberman, 1974). Of the neuropsychological disabilities, visuoperceptive and spatial analysis deficits were studied. Many authors (Asso, 1969, Loranger et al., 1972 and Gil & Lefevre, 1979), noticed low scores of parkinsonians in the visuospatial WAIS subtest (Block design, object assembly, picture arrangement) in contrast to the normal scores reached in verbal WAIS subtest. (Villardita et al. 1982), reported visuoperceptive deficit in PD and stated that these deficit stems from the syndrome itself and mental deterioration, if present, only heightens the degree of this disability. The last authors also said that visuoperceptive deficits of parkinsonians cannot be considered as a mental deterioration. In our study patients with PD performed on the Wechsler performance test like the control group with insignificant difference between both group. Also there were no mental or memory disturbance could be found in comparison with the control group. The same results were reached by Bowen's (1976) and Lees (1983). Because medication and aging effect were excluded, we agree with the opinion of Bowen's and Lees, that the subtle difficulty noticed in some of parkinsonian patients cannot be attributed to wide differences in overall intellectual function and those patients seemed incapable of checking responses they realized to be incorrect, continuing with long runs of perservative errors. It is now known that damage to the dopamine-containing mesocorticolimbic pathway occur in parkinson's disease (Javoy-Agid et al., 1981).

This bundle of cells arising in the ventromedial tegmental area of the midbrain projects to the cingulate and frontal cortex. Its function is not yet known, but it may assist the frontal lobe in mediating and monitoring behaviour. In our study the deficits noticed in some of parkinsonian patients might be caused by destruction of this pathway and a comparable loss of dopaminergic neurons in the neighbouring nigrostriatal bundle could explain the reported correlation between motor deficits and intellectual decline reported by others (Mortimer et al., 1982).

We found a relationship between laterality of parkinsonian motor symptoms and visuo spatial deficits. Those patients with right sided PD scored significantly lower on WBS subtests for visual motor coordination and performance conceptualization That difference may be due to the motor disability itself because these deficits were noticed only on block design and digit symbol tests. Yet due to the smaller number of cases chosen in this study, that difference needs further study. Several studies have found a direct correlation between the degree of intellectual impairment and the severity of bradykinesia in PD, the relationship holding even when age and age at onset are controlled (Mortimer et al., 1982). Another researcher (Rossor et al., 1980 and Glick et al., 1982), found evidence for left-right asymmetrics in dopaminergic systems in human brains.Direfeld et al. (1984), after cerebrospinal fluid examination for dopaminergic systems and neuropsychological testing, found that patients with PD group left side showed greater neuropsychological impairment than group right sided PD. However those authors said that they did not exclude the chronic effect of long-term dopaminergie treatment which will still present after 48 hours discontinuation of dopaminergic medications. In our study all, the patients received no treatment (even those with 20 year duration of the disease).

In our study there were no differences in performance of the visuoperceptive tests in those patients with a slight deficit in a variety of cognitive tasks and in those without cognitive deficits. Also the duration

of the disease had no effect on cognitive function in patients with PD and that was shown more apparent in that patient of 20 year duration. His scores in all the tests were higher than the rest of the twenty patients. These results are in agreement with results of Marsh et al. (1971). He postulated that there is no specific type of mental impairment in PD and it is rather a slight deficit in a variety of perceptual and cognitive tasks in patients otherwise intellectually intact and well oriented. Jacobi et al. (1978), mentioned that, there is no cognitive deficit in PD, it is merely a drop in the speed of recognition. Albert, (1978), said that the cognitive deficits that may occur in PD share similarities with the difficulties experienced by normal old people. Other authors (Gil, R. and Lefevrel, 1979), postulated that, bradyphrenia, which is the psychiatric correlate of akinesia, gives only a superficial impression of intellectual impairment in patients with PD. They said that, though processesses are slowed down, but judgement and the handling of concepts are unchanged.

In conclusion in this work, there was no impairment of the general intellectual function including visuoperceptive and spatial abilities in Egyptian patients with PD on WBS tests. The subtle cognitive deficits identified in parkinsonian patients in this study might be (as less 1983 stated), due to a certain rigidity of thinking characteristic of Parkinsons disease. Medication had no role in this study, so the reported intellectual deficits by others may be due to chronic effects of long-term dopaminergic medications. However, we believe that further study with a larger number of patients is still needed.

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موجز

التغيرات فى مجال الادرال البصرى
والمعرفى لدى مرضى باركنسون

تم دراسة التغيرات فى مجال الادراك البصرى عند عشرين مريضا يعانون من مرض باركنسون الذاتى. وباستخدام اختبارات ويكسلر لقدرات الأداء لم يلاحظ وجود أى فرق واضح بين نتائج الاختبار عند المرضى ومثيلاتها فى العينة الضابطة وقد لوحظ بعض الخلل عند المرضى فى الاختبارات التى تقيس الاتزان الحركى البصرى والنواحى الادراكية للأداء الا أن تلك النتائج لم تكن ذات دلالة احصائية فى مجموعها بالمقارنة بنتائج العينة الضابطة وقد يرجع حدوث تلك الصعوبات نتيجة إلى غيبة المرونة العقلية وهو ما يميز هؤلاء المرضى.

ABSTRAIT

La maladie de Parkinson
Les incapacites visuo-perceptives
et les deficits cognitifs

Les incapacites visuo-perceptives de 20 patients droitiers souffrant d'une maladie de Parkinson idiopathique ont été testés. Les épreuves de performance de WAIS n'avaient pas montré une difference significative. Cependant, les resultats individuels des patients montraient des difficultés de coordination visuometrice et de performance de conseptualization. Ces difficultés soulignaient la regidité mentale et l'inflexibilité presentes chez les malades parkinsoniens.