Parkinson's disease
Clinical and electrophysiological evaluation

Muneera A. Al-Bunyan, *MRCP(UK).*

ABSTRACT

Objectives: Identification of the clinical spectrum and the electrophysiological responses of a Saudi population with Parkinson's disease as opposed to a matched normal population.

Methods: Fifty four subjects (41 males and 13 females) were selected for the study. The patients were clinically evaluated for the occurrence of Parkinson's disease symptoms, as well as other associated medical conditions. All patients had brain computerized tomography scans. Electrophysiological tests were performed on all patients using the Medelec ST 10 Sensor 59394 Model. These tests included somatosensory evoked response of median nerves, brain stem auditory evoked responses and visual evoked responses. The significant differences in these evoked responses between the patients with Parkinson's disease and normal patients were statistically evaluated.

Results: Twenty six out of the 40 computerized tomography brain scans which had been carried out showed normal brain morphology and 5 had a clear evidence of cerebrovascular disease while only 9 showed distinctive brain atrophy. The mean values for the brain stem auditory evoked response, the somatosensory evoked response and the visual evoked responses were higher in patients with Parkinson's disease as compared to those who did not have the disease. Significant differences were only seen as prolonged latencies in median nerve somatosensory evoked response, as well as delayed waves I and V on the brain stem auditory evoked response. Inter-wave latencies, however, were not significantly different.

Conclusion: Parkinson's disease in a Saudi population showed significant differences to somatosensory evoked response and brain stem auditory evoked response electrophysiological data as compared to age-matched controls, however, the clinical characteristics of Parkinson's disease in Saudi patients are not significantly different from those reported for patients elsewhere.

Keywords: Parkinson's disease, Saudi population, electro-physiological, data, clinical characteristics.

Saudi Medical Journal 2000; Vol. 21 (1): 72-75

Parkinson's disease is a neurodegenerative disorder of unknown aetiology that usually occurs in old age or late middle age with mean age of 60 years and only about 5 per cent of patients present with symptoms of the disease before 40 years of age.[1-3] Salient clinical features are tremors, muscular rigidity, bradykinesia and impairment of postural reflexes.[1-3] Individually, each of these physical findings are not specific, but collectively presents a syndrome generally termed as Parkinsonism. The 4 most prominent theories regarding the aetiology and pathogenesis of PD are: genetic predisposition, environmental insults (with trigger factors like stress, infection, trauma, drugs, toxins), age-related neuronal attrition and loss of anti-oxidative mechanisms.[4-7] Despite tremendous advances in the treatment of PD, its cause is much a mystery today as it was first described in 1817.

The gold-standard for the diagnosis of PD is the pathological finding of specific degeneration of

From the Department of Neurology, King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia.

Received 17th October 1999. Accepted for publication in final form 14th November 1999.

Address correspondence and reprint request to: Dr. Muneera A. Al-Bunyan, King Khalid University Hospital, PO Box 7805(38), Riyadh 11472, Kingdom of Saudi Arabia. Tel 467 1896/1532 Fax. 467 2424.

nigral and other pigmented brain setm nuclei,[8] with a characteristic inclusion, the lewy body, in remaining nerve cells.[6] Various laboratory investigations have resulted in new approaches to elucidating the pathogenesis of Parkinson's disease. Deficiency of dopamine in the dopaminergic nigrostriatal pathway and destruction of the inhibitory neurons in caudate nuclei, depression and hyperactivation of neurons in striatum results in the formation of a generator of pathologically enhanced excitation "GPEE". These GPEEs represent the pathophysiologic basis for clinical symptoms of Parkinson's disease such as akinesia, rigidity and tremor.[9]

Most studies showed variable occurrence of the different forms of parkinsonism.[10-14] The nosology of Parkinson's disease is evolving, therefore, we decided to identify the clinical spectrum and the electrophysiological responses of a Saudi population suffering from Parkinson's disease as opposed to a normal population. To our knowledge, this is the first report on the characteristics of the electrophysiological finding in patients with Parkinson's disease in a Saudi population.

Methods. Fifty-four patients suffering from Parkinson's disease who presented to the neurology clinics at King Khalid University Hospital from 1985 to 1997 were studied. The diagnosis was based on the presence of 2 or more of the following signs: resting tremor rigidity, akinesia and impaired postular reflexes. Clinical idiopathic Parkinson's disease was diagnosed if a patient had no identifiable cause. In the differential diagnostic procedure, several other diagnoses were considered. Parkinsonism in patients who had used neuroleptic drugs within the last 3 months were classified as drug-induced.

Mild Parkinsonism in patients with dominating dementia was excluded as being secondary to Alzheimer's disease. Multiple system atrophy, however, was diagnosed in patients unresponsive to levodopa therapy and additional signs and symptoms of autonomic failure and co-existing evidence of cerebellar or pyramidal features.

Presenting symptoms were noted in detail and clinical examination performed on all of these patients. Other relevant clinical information which was obtained included areas of residency, type of water used for daily drinking, occupation, as well as family and drug history. Other investigations which were carried out included a CT scan of the brain, electromyography, somatosensory evoked response as well as auditory and visual evoked responses.

Results. The subjects comprised of 41 males and 13 females with a male:female ratio of 3.2:1. Their ages ranged between 60 and 89 years. The predominant symptoms were autonomic and behavioral disorders in the form of depression and withdrawal (Table 1). Less common by occurring symptoms were insomnia, urinary disturbances and dysesthesia. The major signs were: rest tremors, poverty of movement, limb rigidity and a masked face (Table 1). The clinical presentation was asymmetric in 41 cases and symmetrical in 11 subjects including 4 with no identifiable etiology. The associated medical conditions were: diabetes mellitus (6 cases), previous stroke and hypertension in 5 cases each, thyroid disorder and heavy metal exposure in 2 cases each. Nine of the cases admitted to smoking and 3 others took alcohol. Family history of Parkinson's disease was obtained in 2 cases.

Twenty-six out of the 40 CT brain scans which had been carried out (65%) were normal, 9 showed cerebral atrophy and 5 had evidence of cerebrovascular disease which didn't contribute to Parkinson's features (Table 2). The results of the neuroelectrophysiological tests performed including somatosensory evoked response (SSEP) for median nerves (n=36), brainstem auditory evoked responses (BAER) in 39 cases and visual evoked responses

Table 1 - Clinical symptoms and signs*

Symptoms	% of patients	Signs	% of patients
Constipation	63	Tremor	89
Depression	54	Akinesia	89
Seborrhoea	52	Poverty of blinking	89
Withdrawal	48	Limb rigidity	85
Excessive sebum secretion	46	Masked face	83
Pain	35	Monotonous speech	72
Confusion	17	Dyspraxia	52
Insomia	13	Postural hypotension	44
Heat intolerance	11	Pyramidal signs	28
Utinary symptoms	6	Loss of arm swinging	17

*Total No. of patient's = 54=100%

Table 2 - CT brain finding.

Neuroradiological features		Results
Normal		26
Abnormal	General atrophy	7
	Frontal atrophy	2
	Infarction or hemorrhage	5
Total		**38**

Table 3 - Evoked responses in PD and control subjects*.

	PD subjects	Controls	T test
VEP:			
P100 Lat - OD	108.11 (18.36)	107.3 (6.9)	0.25
P100 La. - OS	105.00 (20.23)	105.9 (7.5)	0.25
BAER:			
AD-Lat			
Wave I	1.79 (0.24)	1.70 (0.15)	1.96**
Wave III	3.94 (0.29)	3.90 (0.19)	0.62
Wave V	5.89 (0.49)	5.70 (0.25)	2.12**
I-III Interwave	2.15 (0.25)	2.10 (0.15)	1.05
III-V Interwave	1.94 (0.35)	1.90 (0.18)	0.62
I-V Interwave	4.10 (0.35)	4.00 (0.23)	1.47
AS-Lat			
Wave I	1.81 (0.36)	1.72 (0.27)	1.23
Wave III	3.89 (0.61)	3.85 (0.51)	0.31
Wave V	5.94 (0.63)	5.75 (0.39)	1.57
I-III Interwave	2.90 (0.54)	2.04 (0.36)	0.47
III-V Interwave	2.10 (0.25)	2.10 (0.08)	1.16
I-V Interwave	4.12 (0.58)	4.02 (0.36)	0.90
Median			
SEP/Rt N13	14.22 (2.47)	13.25 (0.68)	2.30**
SEP/Rt N20	20.13 (2.71)	18.98 (0.83)	2.47**
SEP/Lt N13	14.10 (2.58)	13.20 (0.81)	2.70**
SEP/Lt N20	20.38 (1.72)	19.10 (0.77)	4.12**

*Mean values with standard deviation lin parentheses
**Statistically significant

(n=36) as listed in Table 3. The mean values were higher for the patients with Parkinson's disease as compared to their age-matched controls. The significant differences were mainly the prolonged latencies in median nerve SSEP, as well as waves I and V on BAEP although the inter-wave latencies were not significantly different.

Discussion. Idiopathic Parkinsonism is inherently a progressive disorder, but the progression can be very slow. In distinguishing idiopathic Parkinson's disease from other Parkinsonian syndromes, asymmetry of clinical deficits may be helpful. Although it is true that IP is always asymmetrical in its early stages, unequal disturbances on each side is frequently encountered in other Parkinsonian syndromes.

The diagnostic criteria which have been subjected to reliability and validation studies include: (1) the presence of at least 1 year of 2 of the following cardinal motor signs: resting/postural tremor; bradykinesia and rigidity. (2) responsiveness to levodopa therapy. Different forms of Parkinson's disease occur in varying percentages in a group of patients, primarily idiopathic, vascular, drug-induced, and hereditary Parkinsonism

The first diagnostic criterion does not take into account postural instability, which occurs in many of the parkinson-plus syndrome and advanced PD. The second criterion is not sufficient by itself to diagnose PD. Other Parkinsonian states have a mild to moderate response to levododopa therapy, although the effect is often transient.

A variety of exclusion criteria for PD have been suggested. These include remitting course of disease, a history of encephalitis lethargica, oculogyric crisis, history of neuroleptic therapy within the previous year, supranuclear downward or lateral gaze palsy, cerebral signs, lower motor neuron signs, autonomic nervous dysfunction. This latter criterior may include syncope, prominent pyramidal symptoms signs, dementia that precedes the Parkinsonian symptoms and rapid disease progression. Evidence of cerebrovascular disease has also been suggested as an exclusion, criterion as Parkinson's disease may occur in a multi-infarct situation. Even with these exclusions, the initial diagnosis of PD may be difficult. Some patients may develop neurological signs with time and initial diagnosis of PD will have to change. The question of whether PD is a single disease entity has been raised. The variable clinical expression of PD indicates that certain subtypes of the disorder may exist.[2] The 2 clinical subtypes that have been suggested are: (1) tremor predominant PD, where there is early onset of disease, preservation of mental status, an often positive family history, and an overall favorable prognosis; (2) postural instability PD, which is associated with worsened functional disability, changes in mental status, unresponsiveness to drug therapy and more rapid progression.

Neurological and electrophysiological procedures like CT-scan, somatosensory evoked potentials (SSEP), electromyography ERG recordings could be useful aids in the diagnosis of Parkinson's disease (PD) and its, differentiation from other forms of Parkinsonism and dementia.[15]

Early studies have found a significant difference in P100 latency between groups of Parkinson's disease patients and normal controls. Both absolute P100 latency and interocular latency differences were delayed. However, despite significant group differences, majority of patients had latencies within normal limits when clinical diagnostic criteria were applied individually. Some studies have shown correlation between disease severity and ERG and VEP abnormalities. Dopaminergic cells in the retina are believed to be the site of the lesion. More recently, color contrast was seen to the more selectively impaired in Parkinson's patients. The frontal N30 potential has been shown to be impaired in Parkinson's disease patients with somatosensory

stimulation. This potential was also shown to improve with administration of apomorphine hydrochloride.

The clinical utility of evoked potentials in Parkinson's disease will depend upon the extent to which testing protocols can be refined to yield specific abnormalities, thus enhancing the sensitivity of the tests. The application of color contrast processing for ERG and VEP testing is an example. Likewise, P300 testing protocols need to be further modified to obtain such system specific findings, since these potentials seems to be a promising diagnostic aid.

Acknowledgments. I am grateful to Dr. Adesola Ogunniyi and Dr. T.R. Swaminathan for their criticisms and technical help and to Ms Lydia Gallardo for typing the manuscript.

References

1. Jankovic J, Mcdermott M, Carter J et al. The variable expression of Parkinson's disease. Neurol 1990; 1529-1534.
2. Marsden CD. Parkinson's disease. Lancet 1990; 335: 948-952.
3. Calne DB, Snow BJ, Lee C et al. Criteria for diagnosing Parkinson's disease. Ann Neurol 1992; (suppl 32): S125-S127.
4. Schapira AHV, Mann VM, Cooper JM, et al. Mitochondrial function in Parkinson's disease. Ann Neurol 1992; 32: S116-S124.
5. Golbe LI. Risk factors in young-onset Parkinson's disease (editorial). Neurol 1993; 43: 1641-1643.
6. Butterfield PG, Valanis BG, Spenser PS, et al. Environmental antecedents of young-onset Parkinson's disease. Neurol 1993; 43: 1150-1158.
7. Hubble JP, Cao T, Hassanein RES, et al. Risk factors for Parkinson's disease. Neurol 1993; 43: 1693-1697.
8. Jankovic J. Theories on the etiology and pathogenesis of Parkinson's disease. Neurology 1992; 22-23. Proceedings from International Symposium 1991, Moscow.
9. Rajput AH, Rozdilsky B, Rajput A et al. Levodopa efficacy and pathological basis of Parkinson's syndrome. Clin Neuropharmacol 1990; 13: 553-558.
10. De Pedro-Cuesta J, Stawiarz L. Parkinson's disease incidence: magnitude, comparability, time trends. Acta Neurol Scand 1991; 84: 382-388.
11. Larsen JP and the Norwegian Study Group of Parkinson's Disease in the Elderly. Parkinson's disease as community health problem: study in Norwegian nursing homes. BMJ 1991; 30: 741-743.
12. J Neurol, Neurosurg, and Psychiatr 1986; 49: 1273-1279. Quinn N. The modern management of Parkinson's disease (editorial). J Neurol, Neurosurg and Psychiatr 1990; 53: 93-95.
13. Stern MB. Clinical and therapeutic aspects of parkinsonism. Neurol July 92; 1-48.
14. Granieri E, Carreras M, Casetta I, et al. Parkinson's disease in Ferrara, Italy, 1967 through 1987. Arch Neurol 1991; 48: 854-857.
15. Watts RL, Mandir AS, Ahn KJ et al. Electrophysiologic analysis of early Parkinson's disease. Neurol 1991; 41 (suppl 2): 44-48.