



ANATOMICAL EXPLORATION OF GERIATRICS CHANGES IN CNS W.S.R TO PARKINSONISM

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ABSTRACT

Geriatric medicine applies the knowledge and clinical skills of the organ-based specialties to a complex group. This group is defined by the reduction in physiological capacity that makes them more susceptible to disease and mortality. As a result they frequently have multiple pathology and illness often presents in atypical ways with confusion, falls, or loss of mobility and day-to-day functioning. Ageing is not an 'intrinsic' process, as it occurs in the context of an organism's interaction with the environment. Due to all these the impact of studying the degenerative diseases among this group holds great importance hence one of the most common disease produced by degeneration of neurons particularly related to basal ganglia i.e, Parkinson's disease afflicts >1 million individuals in the United States (1% of those > 55 years) peak age of onset in the 60s (range is 35 to 85); course progressive over 10 to 25 years. The incidence rates in different countries vary from 1.5 to 20 per 100,000 per year. It is in detail to explore the anatomical concepts behind it which will be helpful in further treatment.

KEYWORDS: Parkinsons Disease, Basal Ganglia, Incidence Rates, Geriatrics.

INTRODUCTION

The epidemiology of Parkinson disease (PD) has important public health and social implications and also provides etiologic clues. India is a multiethnic country with genetic diversity with an aging population and increased life expectancy, it is expected that the disease burden due to Parkinson disease will be enormous. Parkinson disease afflicts >1 million individuals in the United States (1% of those > 55 years) peak age of onset in the 60s (range is 35 to 85); course progressive over 10 to 25 years.^[1] The incidence rates (IRs) in different countries vary from 1.5 to 20 per 100,000 per year.^[2] Disability is common in old age but patients function can often be improved by the interventions of the multidisciplinary team, which includes nurses and physiotherapy, occupational and speech therapy and medical staff. Although the proportion of the population aged over 65 is greater in developed countries, most older people live in the developing world. Two-thirds of the world population of people aged over 65 live in developing countries at present and this is projected to rise to 75% in 2025.^[3]

The pace of population ageing is much faster in developing countries and so they will have less time to adjust to its impact. The older population is extremely diverse. Many older people enjoy an active healthy life into advanced old age. A substantial proportion of 90

years live alone and manage with little support, while some 70-year-olds are severely disabled by chronic disease. Aging is a natural process that produces several changes in structure and function leading to increased vulnerability and decreased viability to disease. Due to increased elderly population, the prevalence of Geriatric specific disease conditions is also increasing. This is creating a big burden to the health care providers and the government. Hence the physician must know the structural changes which will help in maintaining the underlying disease.

Among the chronic diseases of geriatric age group the common are degenerative diseases specifically pertaining to neurons these conditions can be defined has in which there is progressive loss of neurons in part of CNS or PNS.^[4] parkinsons disease can be studied under the degeneration of neurons related to Basal ganglia to know the effect of this disease on body and to treat it properly one must have thorough knowledge regarding the anatomy of the structure involved in causation of it.

Anatomy and functions of Basal ganglia

Basal ganglia are the scattered masses of gray matter submerged in subcortical substance of cerebral hemisphere. Basal ganglia form the part of extra pyramidal system, which is concerned with motor activities. Basal ganglia include three primary

components those are Corpus striatum, Substantia nigra, Subthalamic nucleus of Luys.^[5]

Connections of basal ganglia Afferent, efferent connections of corpus striatum, substantia nigra and subthalamic nucleus of Luys. In addition to afferent and efferent connections, different components of corpus striatum of the same side are interconnected by intrinsic fibers.^[6]

1. Putamen to globus pallidus.
2. Caudate nucleus to globus pallidus.
3. Caudate nucleus to putamen.

Different components of corpus striatum in each side are connected to those of the opposite side by commissural fibers.

Functions

- ◆ Control of muscle tone.
- ◆ Control of Motor activity.
- ◆ Reflex muscular activity.
- ◆ Control of automatic associated movements.

Functions of basal ganglia on motor activities are executed by some neurotransmitters released by nerve endings within basal ganglia. Following neurotransmitters are released in basal ganglia.^[7]

- ◆ Dopamine released by dopaminergic fibers from substantia nigra to corpus striatum (putamen and caudate nucleus: dopaminergic nigrostriatal fibers): deficiency of dopamine leads to parkinsonism.
- ◆ Gamma-aminobutyric acid (GABA) secreted by intrinsic fibers of corpus striatum and substantia nigra.
- ◆ Acetylcholine released by fibers from cerebral cortex to caudate nucleus and putamen.
- ◆ Substance P released by fibers from globus pallidus reaching substantia nigra.
- ◆ Enkephalins released by fibers from globus pallidus reaching substantia nigra.
- ◆ Noradrenaline secreted by fibers between basal ganglia and reticular formation.
- ◆ Glutamic acid secreted by fibers from subthalamic nucleus to globus pallidus and substantia nigra. Among these neurotransmitters, dopamine and GABA are inhibitory neurotransmitters. So, the fibers releasing dopamine and GABA are inhibitory fibers. All other neurotransmitters have excitatory function.

Parkinsonism

It is a syndrome of chronic progressive disorder of motor function and is clinically characterised by tremors which are most conspicuous at rest and worsen with emotional stress.^[8] Other features are rigidity and abnormal gait and posture. Main features of this are enlisted as follows.^[9]

- ◆ Rigidity (increased ratchet-like resistance to passive limb movements).
- ◆ Bradykinesia (slowness of voluntary movements).

- ◆ Fixed expressionless face (facial masking) with reduced frequency of blinking
- ◆ Hypophonic voice
- ◆ Drooling and impaired rapid alternating movements
- ◆ Micrographia (small handwriting),
- ◆ Reduced arm swing while walking
- ◆ Flexed stooped posture with walking, shuffling gait, difficulty initiating or stopping walking, en-bloc turning (multiple small steps required to turn)
- ◆ Retropulsion (tendency to fall backwards).

Non-motor aspects of Parkinsonism included expression and anxiety, cognitive impairment, sleep disturbances, sensation of inner restlessness, loss of smell (anosmia), and disturbances of autonomic function. In advanced Parkinsonism, intellectual and behavioural deterioration, aspiration pneumonia and bedsores (due to immobility) common.

DISCUSSION

The main feature of Parkinson's disease is abnormalities of posture and movement due to aggregates of melanin containing nerve cells in brain stem, intracytoplasmic neuronal inclusions (Lewy bodies) within the nigral cells. The main efferent and afferent connections of substantia nigra are with the caudate nucleus and putamen collectively called as striatum. Dopamine produced by neurons in the pars compacta of substantia nigra passes along their axons to the mesostriatal dopamine system due to the degeneration of striatum in Parkinson's disease production of dopamine is much reduced. The degenerative diseases of CNS are associated with abnormal clumps of protein alpha-synuclein these clumps are called Lewy bodies found in nerve cells throughout the outer layer of the brain particularly in cerebral cortex, deeper to the midbrain.

- ◆ Tonicity of the muscle: Rigidity is the inability of the muscles to relax normally, is caused by uncontrolled tensing of muscles and inhibits ability of free movement hence in Parkinsonism during medial or lateral rotation of joint one can sense jerky feeling which is early sign termed as cog wheeling, also a form of increased tonicity can also produce muscle stiffness and fatigue.

◆ **Gait:** Bradykinesia is due to failure of output of basal ganglia to reinforce the cortical mechanisms that prepare and execute the commands of movement it is more deficit in motor areas of midline which leads to difficulty in self-paced movements. Flexed stooped posture with walking, shuffling gait, difficulty initiating or stopping walking, en-bloc turning (multiple small steps required to turn). There are specific group of neurons in CNS which deals with movement located in substantia nigra in ventral mid brain these neurons give an extensive network later innervate with basal ganglia. These two neuronal groups communicate with each other by producing neurotransmitter dopamine. In Parkinsonism due to progressive degeneration of nigral neurons the amount of dopamine in the corpus striatum is decreased all of these changes result in impaired movements.

◆Face: the facial muscles are responsible for various expressions like smile, frown and various subtle feelings the main factor responsible for all these is neurotransmitter dopamine but in Parkinsonism due to damage of dopamine producing cells these expressions will be lost along with decreased blinking rate.

◆Speech: Dysarthric due to reduction in amplitude and precision of speech articulators like tongue, palate and lips.

◆Balance: susceptible to fall backward while walking called as backward disequilibrium due to loss of autonomy in geriatric age group main cause of this is cortical and subcortical lesions of CNS. It is characterised by a posterior position of the centre of mass with respect to base of support in the standing or sitting positions which predisposes body to tilt backwards associated with rigidity in axial and appendicular skeleton.

CONCLUSION

Geriatrics is branch of medicine which specially deals with people of old age. This branch is having high demand in these days maximum multispecialty hospitals are designed focussing on only problems related to the people of old age, hence each and every disease of this group must be studied in detail because Ageing is not an 'intrinsic' process, as it occurs in the context of an organism's interaction with the environment. Due to the maximum incidence of Parkinson's disease it is studied in detail and explored anatomically because to treat any disease one must know from its root of origin and changes in specific structure.

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