Parkinson’s disease exemplifies the art and science of geriatric medicine.

Introduction

First described by Dr. James Parkinson in the classic essay “The Shaking Palsy” in 1817\(^{(1)}\), Parkinson’s disease is characterised by motor symptoms including resting tremor, rigidity, bradykinesia, freezing and postural instability. The role of both science and art in geriatric medicine is important, as geriatric patients often have multiple co-morbidities which require holistic, patient specific management reliant on experience as much as theoretical knowledge. As a heterogeneous, neurodegenerative disease affecting primarily the elderly, a clinicians’ role in Parkinson’s disease typifies much of the common practice in geriatric medicine. This essay explores both the art and science of geriatric medicine, particularly focusing on the role of each with respect to the understanding, diagnosis and management of Parkinson’s disease.

Parkinson’s disease and aetiology

Parkinson’s disease is the second most common neurodegenerative disease which affects dopaminergic neurons within the basal ganglia, a subcortical structure comprising of five nuclei responsible for the regulation of many cortical functions, including voluntary motor commands, as well as the oculomotor, limbic and associative regions of the cortex\(^{(2)}\). As many as 3 in a 1000 people suffer from Parkinson’s, which increases with age to affect upto 1-2% of the elderly. The variety of processes regulated by the basal ganglia results in a plethora of possible non-motor manifestations, which can affect almost any body system including mental health problems, sensory impairment and autonomic dysfunction. It is perhaps understandable, therefore, that Parkinson’s is associated with an increased mortality and lower life expectancy\(^{(3)}\), and that an understanding of the relevant scientific pathological processes and neuroanatomy involved in Parkinson’s disease is important for a geriatrician. Within the umbrella of Parkinson’s there exist a series of subtypes, including tremor-dominant and akinetic rigid types, which have clinical and pathological heterogeneity with differing prognostic implications. For example, tremor-dominant disease is considered more benign, whereas later-onset disease is often more rapidly progressing\(^{(4)}\). Recognition of Parkinsonian subtypes is an example of the art of medicine; however independently validated scoring systems such as the Unified Parkinson Disease Rating Scale (UPDRS) have been developed to quantify patient symptoms and functional impairments, therefore helping to standardise the classification of disease severity\(^{(5)}\).

Histopathologically, Parkinson’s is typified by the presence of aggregates of \(\alpha\)-synuclein known as Lewy Bodies, within the basal ganglia and their presence is considered a marker of neuronal degeneration. Mutations within these proteins have been implicated in inherited forms of Parkinson’s
disease, and are among as many of 16 notable loci which have been attributed to increased Parkinson’s risk. Inherited forms of Parkinson’s commonly present at an earlier age, and exploration of genetics is a crucial part of improving the understanding of Parkinson’s disease; with the hope of determining earlier diagnosis to influence patient outcomes in the future\(^6\).

**The diagnosis of Parkinson’s disease**

Parkinsonism is the term given to describe a constellation of symptoms including bradykinesia, resting tremor, rigidity and postural instability, and has a number of both primary and secondary causes. Parkinson’s disease is the commonest primary pathology, however atypical Parkinsonism disorders including multisystem atrophy and progressive supranuclear palsy, and heredodegenerative disorders such as Wilson’s disease can also present similarly. Secondary causes, including neuroleptic, anti-epileptic and anti-dizziness medications, trauma, various infections and toxins are important to consider as they are usually reversible\(^4\). As Parkinson’s disease is a clinical diagnosis, a geriatricians’ knowledge of this differential diagnosis and subsequent accuracy of subsequent clinical history and examination to determine a diagnosis exemplifies much of the art of geriatric medicine with respect to this disease.

However, there is a recognised concern in the accuracy of diagnosis. Hughes *et al* described that even with the use of strict diagnostic criteria, nearly one-third of all pathologically confirmed cases of Parkinson’s disease were missed, often being mistaken for atypical parkinsonism syndromes\(^7\). Accurate, early diagnosis is important because as a neurodegenerative disorder, the commencement of management can have prognostic implications, and this suggests that reliance of clinicians alone may be inadequate, implying a possible need for development of reliable imaging or biomarkers to aide in an accurate Parkinson’s disease diagnosis.

One example of such an imaging technique is the recent advent of the DaTscan in Parkinson’s disease diagnosis. This scan, a form of SPECT imaging, identifies the loss of functional dopaminergic neurones, which is illustrated as variation in the uptake of the ligand within the basal ganglia. Currently, however, the role of the DaTscan is limited to differentiating of Parkinsonism from essential tremor, as current evidence suggests that it is ineffective in separating between Parkinson’s disease and atypical Parkinsonism\(^8\).

Other investigations, such as olfaction tests have been considered for use as screening tools, with hyposmia associated with increased risk of developing Parkinson’s disease over four years\(^9\). Hence, although steps have been taken to provide a reliable investigative method of confirming a diagnosis,
currently they are only used in specific situations, and therefore only form a small role in the work-up of a patient with possible Parkinson’s disease.

**Management of Parkinson’s disease**

Once diagnosed, the long-term management of a patient with Parkinson’s disease requires regular, specialist input. As mentioned previously, the prognosis of these patients is significantly reduced, although the severity of symptoms experienced varies widely. Therefore, for geriatricians who have multiple classes of medication and surgery licensed for use, the choice and regime of medications used is patient specific, and the determination of a medication regime is somewhat of an art form. Moreover, the importance of multi-disciplinary input for both motor and non-motor symptoms of Parkinson’s extends further than a simple understanding of the science behind the disease.

With respect to the motor symptoms of Parkinson’s, the aim of medication is to increase the levels of dopamine within the substantia nigra, for example with dopamine precursors such as Levodopa, or dopamine receptor agonists (e.g. Pramipexole). Other targets of action include decreased breakdown of dopamine within the neurone by COMT inhibitors (e.g. Entacapone) and Monoamine Oxidase B inhibitors (e.g. Selegeline). Also, there is some evidence for the use of Anticholinergics and Amantadine in Parkinson’s disease, although these are last line. Moreover, for especially challenging younger patients the role of surgery, usually by deep brain stimulation of the subthalamic nucleus, is a relatively new but often effective option which can significantly reduce patient motor symptoms\(^{(10)}\).

Levodopa is the most efficacious treatment of motor symptoms in Parkinson’s, however patients regularly experience a “wearing-off” effect after a number of years, with “on-off” motor fluctuations between doses. Hence, it is common for patients to require regular increases to the dose and frequency of Levodopa to control symptoms; however this can be associated with side effects such as dystonia and dyskinesia, which can be equally as detrimental to the patients’ quality of life. Consequently, the extent of Levodopa use is often a compromise between symptoms and side-effects. Therefore common practice is to implement adjunctive dopamine agonists with Levodopa, or medications working by alternative pathways, such as Selegeline, to try and minimise the dose of Levodopa required to maintain symptom control\(^{(10)}\). Hence, any regime is optimised on a patient by patient basis to maximise its effect, which typifies both the science and art of geriatricians in this disease, as a doctor must have a thorough understanding of both the drugs they have prescribed, and also of the patients’ specific requirements.

Furthermore, Parkinson’s disease patients also experience any number of non-motor symptoms; with upto 40% of patients developing dementia, so therefore there is a need for a holistic model of care\(^{(2)}\).
Nurse specialists, for example, are particularly effective in helping with monitoring of a patients’ condition, as well as physiotherapists, occupational therapists and speech and language therapists\(^{(10)}\). This multi-disciplinary approach is important, and illustrates how geriatric patients require more than just an application of medical scientific knowledge, but require specific care tailored to their individual needs.

### Conclusion

Parkinson’s disease is a common, complex and often devastating disease associated with early mortality and significant morbidity. Whilst much of the pathophysiology may be understood, there remains little in the way of scientific understanding of the aetiology of the disease, or of reliable investigation to confirm the diagnosis. With respect to the management, there is no cure to this degenerative disease, and whilst medication has been developed to curb the motor manifestations there is no proven stepwise treatment, and the treatments are not without significant side-effect profiles. Therefore, perhaps more than in many other diseases, much of the geriatricians’ role, both in the diagnosis and management, of this disease still relies on the art of clinical medicine and experience. The diagnosis of this disease relies on accuracy of clinical history and examination, and the management is long-term, holistic and multidisciplinary, with an often unique combination of medications that is regularly reviewed and changed.

Whilst scientific advances are being made to improve the current experience of a patient developing Parkinson’s disease, there still exists a wonderful, intertwined balance between the science and art of geriatric medicine in Parkinson’s disease.
References

(1) Parkinson J. An essay on the shaking palsy. 1817.


