Parkinson's Disease Society

Information Sheet

Diagnosis and Scans

This information sheet discusses the diagnosis of Parkinson's disease and the various types of scan that may help to diagnose the condition.

How is Parkinson's diagnosed?

At present, the diagnosis of Parkinson's is made clinically. This means that the doctor takes a detailed history of the symptoms that a person is experiencing and examines the person to look for any tell-tale signs of Parkinson's or any other signs that may indicate a different diagnosis. The signs of Parkinson's in the early stages may include tremor, stiffness, slowness of movement, difficulties with handwriting and difficulties with making facial expressions. Confirmation of the diagnosis may be made if the person has a positive response to drugs used to treat Parkinson's.

One of the definitive features that indicates that a person has Parkinson's is the presence of structures called Lewy bodies in the brain. However, these Lewy bodies can only be detected by examining the brain under a microscope and this can only be done after the person has died. A scan called a PET (positron emission tomography) can detect the loss of dopamine from the basal ganglia during life. However, there are only about 20 PET scanners in Europe. These are used mainly for research purposes and are expensive.

The doctor may also recommend blood tests or scans to rule out other conditions that can be confused with Parkinson's.

What is essential tremor?

Essential tremor (ET) is a common condition in which the dominant and usually the only symptom is tremor. It is usually different in behaviour from tremors seen in people with Parkinson's, though there is often an overlap in its appearance. ET is usually most obvious when the hands are outstretched or when the upper limbs are being used and it usually affects both right and left sides of the body equally. Classic tremors of Parkinson's are most obvious when the arm is at rest and supported and they tend to improve with movement. Furthermore, at the beginning, the tremor of Parkinson's is usually one sided.

Unlike Parkinson's, ET often occurs in families, starting in mid-teens. Although it can produce functional difficulties for individuals, the other features of Parkinson's do not develop. ET, particularly in the older person, can be difficult to distinguish from Parkinson's at the beginning, and misdiagnosis may result. DaTSCAN offers the potential to help reduce these misdiagnoses and has been shown to differentiate between ET and Parkinson's in the majority of cases.

What is meant by the term 'parkinsonism'?

The main symptoms of Parkinson's – tremor, rigidity and slowness of movement – are also the main symptoms of a wider group of conditions known as parkinsonism. Parkinsonism is also sometimes referred to as 'Parkinson's plus syndromes'.

Parkinsonism occurs when nerve cells do not work properly in a particular part of the brain, the substantia nigra. These nerve cells produce and store dopamine, the chemical messenger that co-ordinates the body's movements.

Several conditions are included in the term 'parkinsonism'. Parkinson's disease is the most common form of parkinsonism. It is also sometimes called 'idiopathic Parkinson's', which implies that the cause is unknown.

Other less common forms of parkinsonism include multiple system atrophy (MSA), progressive supranuclear palsy (PSP) and drug-induced parkinsonism.

Why does misdiagnosis occur?

Although there is no definitive test for Parkinson's, the accuracy of diagnosis based on clinical observation and medical history (as described previously) is relatively high. Studies at the Parkinson's Brain Research Centre in London and elsewhere have shown that 80% of those diagnosed during life as having 'idiopathic Parkinson's' will have the diagnosis confirmed when their brains are

examined under a microscope after death. The remaining 20% will be found to have other causes for their symptoms, such as other types of parkinsonism or ET.

Misdiagnosis can occur because the initial symptoms of the other forms of parkinsonism can be very similar to Parkinson's and, in the absence of a definitive test, it can be very difficult to distinguish between Parkinson's and these other forms of parkinsonism. Poor response to drugs used to treat Parkinson's, or symptoms specific to these other forms of parkinsonism which may occur later in the condition's progress, may indicate that the diagnosed person does not have Parkinson's but one of these other forms.

What is neuroimaging?

Medical imaging techniques allow the visualisation and assessment of functioning of structures within the body that cannot otherwise be easily seen or measured. Neuro-imaging applies to any imaging techniques that are used to study the brain or other parts of the nervous system.

What is a radiopharmaceutical agent?

Radiopharmaceutical agents are chemical compounds containing an isotope, a radioactive element that will allow identification of structures inside the body. These agents are sometimes referred to as tracers or radionuclides. The DaTSCAN uses an iodine – containing compound (ioflupane 123). When injected into the bloodstream, this passes through the blood brain barrier and becomes attached to dopamine transporters in the nigrostriatal dopaminergic system (the system that has degenerated in Parkinson's with consequent reduction of dopamine production). Parkinson's is characterised by severe loss of dopamine neurones and dopamine transporters associated with them.

Uptake of DaTSCAN can be considered a measure of these dopamine transporters and this can be detected by a technique called SPECT scanning (single photon tomographic imaging). SPECT cameras that are able to carry out this measurement are available in most large hospitals and therefore provide an accessible method of supporting the diagnosis of Parkinson's in those people with tremor where there is diagnostic doubt.

What is a CT scan?

This is a technique whereby X-rays are passed through the body from many different directions, and are then analysed by a computer to produce a cross-sectional picture of the body. Brain imaging with this technique is usually normal in uncomplicated Parkinson's.

What is an MRI scan?

This technique uses magnetic charges rather than X-rays to image the brain. It is rarely used in the diagnosis of Parkinson's, since, like the CT scan of those with this condition, it usually looks normal. The true value of MRI in parkinsonian disorders is in the differentiation between Parkinson's and atypical parkinsonism. Several structural MRI changes have been described for MSA and PSP. However, the sensitivity is only around 60–80% or less. A newer MRI technique, known as diffusion-weighted MRI, offers an improved sensitivity of around 100%, so this may be a better technique for differentiation between these disorders.

What is DaTSCAN-SPECT?

DaTSCAN is the first neuroimaging, radiopharmaceutical agent to enable, by means of appropriate brain scanning, doctors to separate Parkinson's from conditions that mimic it, in particular ET. It is now the approved agent to help distinguish ET from Parkinson's plus syndromes in those patients whose diagnosis is clinically uncertain.

How will DaTSCAN help with diagnosis? Can DaTSCAN definitely diagnose idiopathic Parkinson's?

DaTSCAN is a useful diagnostic tool for distinguishing between ET and Parkinson's plus syndromes. It cannot definitely diagnose idiopathic Parkinson's. The scan will only help if the diagnosis is uncertain and the possible diagnosis is either ET or a Parkinson's plus syndrome.

It is of advantage if a person's tremor is unusual or if there is uncertainty about the presence of other Parkinson's symptoms. It is not of value for people in whom the clinical diagnosis is very likely to be either Parkinson's or ET, as the scan will simply restate that the diagnosis is very likely. The scan does not make the diagnosis any more likely.

What is a PET scan?

This is a highly specialised research imaging technique that uses short-lived radioactive substances. PET imaging, using the radiolabelled dye known as fluorine-18-labelled-dopa, shows the characteristic pattern of reduced uptake of the dye to the nerve cells of people with Parkinson's. This is due to the death of these cells, so that they no longer work normally. However, up to 10% of individuals with a clinical diagnosis of Parkinson's might have normal 18F-dopa PET levels. As with DaTSCAN-SPECT, whether this suggests imperfect sensitivity or clinical diagnostic errors is unclear. The patterns of the PET ligand uptake differ between Parkinson's, MSA and PSP, but it has little potential to differentiate between these parkinsonian disorders. PET imaging using another type of radiolabelled dye, referred to as 18-fluorodeoxy-glucose (FDG), is able to distinguish MSA and PSP from Parkinson's. However, restricted availability and high costs do not allow the routine use of PET in clinical work.

What other diagnostic tools for Parkinson's are in progress?

Several other imaging techniques are under development. These include Altropane, a new imaging chemical agent, currently in research at the Harvard Medical School and Massachusetts General Hospital in the USA. Altropane has the potential to diagnose Parkinson's more accurately and earlier in the progression of the condition than is currently possible.

Researchers in Sydney, Australia, have developed a blood test that appears to be able to detect Parkinson's soon after symptoms begin to show. However, this test is still very experimental and is not expected to be available for several years.

Acknowledgements

The Parkinson's Disease Society would like to thank Dr R Grunewald and Julia Johnston, speech and language therapist, for their help with reviewing this information sheet.

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Revised March 2008