

ACUPUNCTURE AND PARKINSON'S DISEASE

About Parkinson's disease

Parkinson's disease (PD) is a progressive neurodegenerative condition. In the UK, around 16–18 in every 10,000 have Parkinson's disease.(Mutch 1986) It is loss of dopamine-containing cells in the substantia nigra area of the brain that results in the typical symptoms of rigidity, bradykinesia, tremor and postural instability.(Mutch 1986) Parkinsonism can also be caused by drugs, and conditions that are less common than PD. These include multiple cerebral infarction and degenerative conditions such as progressive supra-nuclear palsy (PSP) and multiple system atrophy (MSA).(NICE 2006)

The condition can severely limit function with, for example, about 10% of those with Parkinson's disease being dependent on a wheelchair.(Mutch 1986) By the time of death, the affected region of the brain has lost 50–70% of its neurons compared with the same region in unaffected individuals.(Mutch 1986) The only consistent environmental factor associated with Parkinson's disease is cigarette smoking.(Davies 2008) At present, there are no proven neuroprotective therapies; only symptomatic treatments are available. These include drugs therapy such as levodopa and dopamine agonists, MAO-B inhibitors and COMT inhibitors, surgery and physiotherapy.

References

Davie CA. A review of Parkinson's disease. *Brit Med Bull* 2008; 80: 109-27.

Mutch WJ et al. Parkinson's disease in a Scottish city. *BMJ* 1986; 292: 534-6.

NICE (2006). Parkinson's disease. Clinical guideline 35 [online]. Available: <http://www.nice.org.uk/nicemedia/live/10984/30088/30088.pdf>

How acupuncture can help

This Factsheet focuses on the evidence for acupuncture in the management of patients with Parkinson's disease.

There have been two systematic reviews on the subject, both of which found evidence that acupuncture may be effective for treating idiopathic Parkinson's disease, but also concluded that more (and larger) high quality studies are needed to confirm this. (Lam 2008; Lee 2008).

There have been several randomised controlled trials published since these systematic reviews. In two studies acupuncture (Mei 2010) or acupuncture plus Chinese herbs (Huang 2009) were at least as good as orthodox medication. Also, adjunctive acupuncture has been found to improve the therapeutic effect of drugs alone (Ren 2008, Chang 2008). In one trial both standard and bee venom acupuncture (i.e. injecting dilute bee venom into acupuncture points) were superior to a no-treatment control (Cho 2012). These studies also suggest that an adjunctive acupuncture regime

could allow lower doses of medication to be used, and hence fewer side effects. However, the trials have continued to be small, and not replicated in the West, so the systematic review caveats still hold.

In general, acupuncture is believed to stimulate the nervous system and cause the release of neurochemical messenger molecules. The resulting biochemical changes influence the body's homeostatic mechanisms, thus promoting physical and emotional well-being.

Research has shown that acupuncture treatment may specifically help in the management of Parkinson's disease by:

- affecting neural mechanisms involving the basal ganglia-thalamocortical circuit of the brain (Chae 2009);
- increasing cerebral blood flow in the most affected hemisphere (Huang 2010);
- improving cerebral glucose metabolism (Huang 2009);
- enhancing synaptic dopamine availability, which may play a critical role in motor function improvement (Kim 2011a);
- attenuating neuronal damage and increasing the number of neurons in the substantia nigra (Yang 2011, Wang 2010);
- activating the PI3K/Akt signalling pathway (and hence regulating cellular survival) in the substantia nigra, (Kim 2011b);
- mobilising the antioxidant defence system (via substances such as superoxide dismutase) to protect neurons in the nigrostriatal system (Wang 2011, Yu 2010)
- acting on areas of the brain known to reduce sensitivity to pain and stress, as well as promoting relaxation and deactivating the 'analytical' brain, which is responsible for anxiety and worry (Hui 2010; Hui 2009);
- increasing the release of adenosine, which has antinociceptive properties (Goldman 2010).

About traditional acupuncture

Acupuncture is a tried and tested system of traditional medicine, which has been used in China and other eastern cultures for thousands of years to restore, promote and maintain good health. Its benefits are now widely acknowledged all over the world, and in the past decade traditional acupuncture has begun to feature more prominently in mainstream healthcare in the UK. In conjunction with needling, the practitioner may use techniques such as moxibustion, cupping, massage or electro-acupuncture. They may also suggest dietary or lifestyle changes.

Traditional acupuncture takes a holistic approach to health and regards illness as a sign that the body is out of balance. The exact pattern and degree of imbalance is unique to each individual. The traditional acupuncturist's skill lies in identifying the precise nature of the underlying disharmony and selecting the most effective treatment.

The choice of acupuncture points will be specific to each patient's needs. Traditional acupuncture can also be used as a preventive measure to strengthen the constitution and promote general wellbeing.

An increasing weight of evidence from Western scientific research (see overleaf) is demonstrating the effectiveness of acupuncture for treating a wide variety of conditions. From a biomedical viewpoint, acupuncture is believed to stimulate the nervous system, influencing the production of the body's communication substances – hormones and neurotransmitters. The resulting biochemical changes activate the body's self-regulating homeostatic systems, stimulating its natural healing abilities and promoting physical and emotional wellbeing.

About the British Acupuncture Council

With over 3000 members, the British Acupuncture Council (BAcC) is the UK's largest professional body for traditional acupuncturists. Membership of the BAcC guarantees excellence in training, safe practice and professional conduct. To find a qualified traditional acupuncturist, contact the BAcC on 020 8735 0400 or visit www.acupuncture.org.uk

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The evidence

Research	Conclusion
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Systematic reviews

Lam YC et al. Efficacy and safety of acupuncture for idiopathic Parkinson's disease: a systematic review. <i>J Altern Complement Med.</i> 2008;14(6):663-71.	A systematic review that assessed the efficacy and safety of acupuncture therapy (monotherapy or adjuvant therapy), compared with placebo, conventional interventions, or no treatment in treating patients with idiopathic Parkinson's disease. Ten randomised controlled trials were included, each using a different set of acupoints and manipulation of needles. Nine of the trials claimed a statistically significant positive effect from acupuncture as compared with their control; only one indicated that there were no statistically significant differences for all variables measured. Only 2 studies described details about adverse events. The reviewers concluded that there is evidence indicating that acupuncture may be effective for treating idiopathic Parkinson's disease. However, they stated that the results were limited by methodological flaws in the studies, and missing information about allocation concealment, number of dropouts, and blinding methods.
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Lee MS et al. Effectiveness of acupuncture for Parkinson's disease: a systematic review. <i>Mov Disord.</i> 2008;23(11):1505-15.	A systematic review that assessed the clinical evidence for or against acupuncture as a treatment for Parkinson's disease (PD). Eleven randomised controlled trials were included. Three assessed the effectiveness of acupuncture on Unified Parkinson's Disease Rating Scale (UPDRS) compared with placebo acupuncture. A meta-analysis of these studies showed no significant effect. Another 6 trials compared the effects of acupuncture plus conventional drugs on symptoms of PD with drugs only. A meta-analysis of 2 of these studies suggested a positive effect of scalp acupuncture (1.46, 95% CI = 1.15 to 1.87). Two further trials tested acupuncture versus no treatment. The meta-analysis of these studies also suggested beneficial effects of acupuncture. The reviewers concluded that the evidence for the effectiveness of acupuncture for treating PD is not convincing because the number and quality of trials, as well as their total sample size are too low to draw any firm conclusion.
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Randomised controlled trials

Cho SY et al. Effectiveness of acupuncture and bee venom acupuncture in idiopathic Parkinson's disease. <i>Parkinsonism Relat Disord.</i> 2012 May 24. [Epub ahead of print]	A randomised controlled trial that explored the effectiveness of both acupuncture and bee venom acupuncture as adjuvant therapies for idiopathic Parkinson's disease. Forty-three adults were assigned to 1 of 3 groups: acupuncture, bee venom acupuncture, or a control group that did not receive any treatment. Participants in the bee venom acupuncture group
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	<p>showed significant improvement on the Unified Parkinson's Disease Rating Scale (total score, as well as parts II and III individually), the Berg Balance Scale, and the 30m walking time. When compared to the control group, the bee venom acupuncture group experienced significantly greater improvement on the Unified Parkinson's Disease Rating Scale. In the acupuncture group, the Unified Parkinson's Disease Rating Scale (part III and total scores) and the Beck Depression Inventory showed significant improvement. The control group showed no significant changes in any outcome after 8 weeks. The researchers concluded that both acupuncture and bee venom acupuncture showed promising results as adjuvant therapies for Parkinson's disease.</p>
<p>Mei CM et al. Clinical observation on the therapeutic effect of acupuncture at the paravertebral points on Parkinson's disease (PD). <i>International Journal of Clinical Acupuncture</i> 2010;19(4):143-4.</p>	<p>A randomised controlled trial that looked at the clinical effects of acupuncture in 48 patients with Parkinson's disease compared with a control group who received Madopar. The clinical effects were assessed with the Improved Webster Scale, and the differences of the curative effects were compared between the 2 groups. The therapeutic effects of acupuncture were found to be as good as Western medicine treatment, with fewer side effects.</p>
<p>Huang W-Y et al. Clinical observation of combined acupuncture and herbs in treating Parkinson's disease. <i>Journal of Acupuncture and Tuina Science</i>. 2009;7:33-36.</p>	<p>A randomised controlled trial that observed the clinical efficacy of linear scalp-acupuncture combined with herbs in the treatment of Parkinson's disease (PD). One hundred and fifty patients were allocated to 1 of 4 groups: group A was treated with linear scalp-acupuncture plus Chinese herbs; group B was treated only with linear scalp-acupuncture; group C was treated only with herbs; group D, were treated with dopamine. The total response rate was 89.8% in group A compared to 86.4% in group D ($p>0.05$), and higher than 65.0% in group C ($p<0.01$). The researchers concluded that linear scalp-acupuncture combined with herbs is quite effective in the treatment of Parkinson's disease.</p>
<p>Ren XM. Fifty cases of Parkinson's disease treated by acupuncture combined with madopar. <i>J Tradit Chin Med</i>. 2008;28(4):255-7.</p>	<p>A randomised controlled trial that compared acupuncture plus Madopar with Madopar alone in 80 patients with Parkinson's disease. A total effective rate of 92% was achieved with obvious alleviation of motor disorder in the combined treatment group, which was significantly higher than that in the Madopar alone group ($p<0.05$). The researchers concluded that acupuncture can enhance the therapeutic effects of western medicine and lessen the dose of the medicine needed.</p>
<p>Chang XH et al. Observation on therapeutic effect of acupuncture combined with medicine on Parkinson disease. [Article in Chinese] <i>Zhongguo Zhen Jiu</i>. 2008;28(9):645-7.</p>	<p>A randomised controlled trial that assessed therapeutic effect of acupuncture as an adjunct to Madopar in 60 people with Parkinson's disease (PD). The control group was given Madopar alone. The total improvement rate of 80.0% in the acupuncture plus medication group was significantly higher than 60.0% in the medication group ($p<0.05$); the decrease in the cumulative score of the Parkinson's disease function rating scale (modified UPDRS) was better in the acupuncture plus medication group than that in the medication group ($p<0.05$). The researchers concluded that acupuncture has a beneficial therapeutic effect in Parkinson's disease.</p>

Physiology and animal studies

Kim SN et al. Acupuncture enhances the synaptic dopamine availability to improve motor function in a mouse model of Parkinson's disease. *PLoS One*. 2011;6(11):e27566. Epub 2011a Nov 22.

A study that investigated whether acupuncture treatment affected dopamine neurotransmission in a Parkinson's disease mouse model using 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP). Acupuncture was found to improve motor function with accompanying dopaminergic neuron protection against MPTP, but did not restore striatal dopamine depletion. Instead, acupuncture treatment increased dopamine release that in turn, may lead to the enhancement of dopamine availability in the synaptic cleft. Moreover, acupuncture treatment mitigated MPTP-induced abnormal postsynaptic changes, suggesting that it may increase postsynaptic dopamine neurotransmission and facilitate the normalisation of basal ganglia activity. The researchers concluded that results suggest that the acupuncture-induced enhancement of synaptic dopamine availability may play a critical role in motor function improvement against MPTP.

Kim SN et al. Phosphatidylinositol 3-kinase/Akt signaling pathway mediates acupuncture-induced dopaminergic neuron protection and motor function improvement in a mouse model of Parkinson's disease. *Int J Neurosci*. 2011;121(10):562-9. Epub 2011b Jul 19.

A study that investigated the effects and the underlying mechanism of acupuncture in a mouse model of PD using MPTP. MPTP-induced impairment of Akt activation, but not MPTP-induced c-Jun activation, was effectively restored by acupuncture treatment in the substantia nigra. Specific inhibition of the phosphatidylinositol 3-kinase (PI3K)/Akt signalling pathway by intranasal administration of LY294002, significantly blocked acupuncture-induced dopaminergic neuron protection and motor function improvement. The researchers concluded that the results provide evidence that PI3K/Akt signalling pathway may play a central role in the mechanism underlying acupuncture-induced benefits in mice with induced Parkinsonism.

Yang JL et al. Neuroprotection effects of retained acupuncture in neurotoxin-induced Parkinson's disease mice. *Brain Behav Immun*. 2011 Oct;25(7):1452-9. Epub 2011 Jun 12.

A study that investigated the role of retained acupuncture (RA) in neurotoxin-induced Parkinson's disease (PD) mice. The number of tyrosine hydroxylase (TH+) neurons and the expression of TH proteins were significantly higher with retained acupuncture than with sham acupuncture or electroacupuncture. Retained acupuncture also increased the uptake of [(123)I] IBZM into the striatum compared with sham acupuncture. The researchers concluded that retained acupuncture possibly attenuates neuronal damage in MPTP-induced PD mice, which suggests it may be useful as a complementary strategy when treating human PD.

Wang H et al. The antioxidative effect of electro-acupuncture in a mouse model of Parkinson's disease. *PLoS One*. 2011;6(5):e19790. Epub 2011 May 23.

A study that administered 100 Hz EA stimulation at two acupoints to MPTP treated mice. It found that, in the striatum of mice, the EA stimulation effectively inhibited the production of hydrogen peroxide and malonaldehyde, and increased glutathione concentration and total superoxide dismutase activity through biochemical methods. However, it decreased glutathione peroxidase activity via biochemical analysis and did not affect the level of 1-methyl-4-phenylpyridinium in the striatum. The researchers concluded that the data suggest that 100 Hz EA

stimulation in the MPTP model of PD has anti-oxidative effects.

Wang YC et al. Effect of electroacupuncture on morphological changes and apoptosis of substantia nigra cells in Parkinson's disease rats. [Article in Chinese] Zhen Ci Yan Jiu. 2010;35(6):415-21.

A study that looked at the influence of electroacupuncture (EA) on morphological changes and apoptotic percentage of substantia nigra cells in rats. The results showed that electroacupuncture therapy can significantly increase the number of neurons in the substantia nigra and the density of striatum nerve fibres, and reduce the apoptotic percentage of substantia nigra cells in Parkinsonian rats, which may contribute to its effect in relieving Parkinson's disease.

Yu YP et al. Acupuncture inhibits oxidative stress and rotational behavior in 6-hydroxydopamine lesioned rat. Brain Res. 2010 Jun 8;1336:58-65. Epub 2010 Apr 24.

A study that evaluated the status of oxidative stress, as well as the antioxidant enzyme response, and the role of acupuncture stimulation on regulating oxidative stress in the nigrostriatal system in the lesioned rat. Brain malondialdehyde (MDA) levels significantly increased, while glutathione (GSH) levels were decreased in impaired groups with 6-hydroxydopamine (6-OHDA) injection only, accompanied by a marked reduction in the level of superoxide dismutase (SOD) and glutathione peroxidase (GSH-Px). The levels of oxidative stress related parameters, except catalase (CAT), as well as the rotational asymmetry, were reversed by acupuncture stimulation. These results showed that acupuncture treatment displayed anti-oxidative and/or neuroprotective properties in the 6-OHDA lesioned rat and these protective properties might be mediated, at least in part, by involving regulation of the antioxidant defence system.

Huang Y et al. Complementary acupuncture in Parkinson's disease: a spect study. Int J Neurosci. 2010;120(2):150-4.

The effects of adjunctive acupuncture in Parkinson's disease were studied using single photon emission computed tomography (SPECT) measures of 99mTc-ECD and 99mTc-TRODAT-4, before and after treatment. Ten patients were randomly assigned to receive levodopa alone (controls) or levodopa and complementary scalp electroacupuncture. Treatment with levodopa alone did not change regional cerebral blood flow (rCBF), but it did increase basal ganglion dopamine transporter (DAT) activity in the most affected hemisphere. Patients who received levodopa plus acupuncture had increased rCBF in the frontal lobe, the occipital lobe, the basal ganglion, and the cerebellum in the most affected hemisphere as compared to baseline, but there were no changes in basal ganglia DAT levels. The researchers concluded that adjunctive acupuncture treatment in Parkinson's disease may affect rCBF but not basal ganglion DAT.

Hui KK et al. Acupuncture, the limbic system, and the anticorrelated networks of the brain. Auton Neurosci 2010; 157: 81-90.

Studies have shown that acupuncture stimulation, when associated with sensations comprising deqi, evokes deactivation of a limbic-paralimbic-neocortical network, as well as activation of somatosensory brain regions. These networks closely match the default mode network and the anti-correlated task-positive network. The effect of acupuncture on the brain is integrated at multiple levels, down to the brainstem and cerebellum and appears to go beyond either simple placebo or somatosensory needling effects. Needling needs to be done carefully, as very strong or painful sensations can attenuate or even reverse the desired effects. Their results suggest that acupuncture mobilises

	<p>the functionally anti-correlated networks of the brain to mediate its actions, and that the effect is dependent on the psychophysical response. They discuss potential clinical application to disease states including chronic pain, major depression, schizophrenia, autism, and Alzheimer's disease.</p>
<p>Goldman N et al. Adenosine A1 receptors mediate local anti-nociceptive effects of acupuncture. <i>Nat Neurosci</i> 2010; May 30.</p>	<p>A study showing that the neuromodulator adenosine, which has anti-nociceptive properties, was released during acupuncture in mice, and that its anti-nociceptive actions required adenosine A1 receptor expression. Direct injection of an adenosine A1 receptor agonist replicated the analgesic effect of acupuncture. Inhibition of enzymes involved in adenosine degradation potentiated the acupuncture-elicited increase in adenosine, as well as its anti-nociceptive effect. The researchers concluded that their observations indicate that adenosine mediates the effects of acupuncture and that interfering with adenosine metabolism may prolong the clinical benefit of acupuncture.</p>
<p>Chae Y et al. Parsing brain activity associated with acupuncture treatment in Parkinson's diseases. <i>Mov Disord.</i> 2009;24(12):1794-802.</p>	<p>A study that using functional magnetic resonance imaging (fMRI) to explore the neural mechanisms underlying the effect of specific and genuine acupuncture treatment on the motor function in patients with Parkinson's disease. The researchers concluded the findings suggested that acupuncture treatment might facilitate improvement in the motor functioning of patients with Parkinson's disease via the basal ganglia-thalamocortical circuit.</p>
<p>Huang Y Complementary acupuncture treatment increases cerebral metabolism in patients with Parkinson's disease. <i>Int J Neurosci.</i> 2009;119(8):1190-7.</p>	<p>A study that used positron emission tomography (PET) and the 18-fluorodeoxyglucose tracer to study cerebral effects of adjunctive acupuncture in Parkinson's disease. No changes were observed in patients who received Madopar only. The researchers concluded the findings suggested that acupuncture plus Madopar may improve cerebral glucose metabolism in Parkinson's disease.</p>
<p>Hui K.K.-S. The salient characteristics of the central effects of acupuncture needling: limbic-paralimbic-neocortical network modulation. <i>Human Brain Mapping</i> 2009; 30: 1196-206.</p>	<p>This study assessed the results of fMRI on 10 healthy adults during manual acupuncture at 3 acupuncture points and a sham point on the dorsum of the foot. Although certain differences were seen between real and sham points, the hemodynamic and psychophysical responses were generally similar for all 4 points. Acupuncture produced extensive deactivation of the limbic-paralimbic-neocortical system. Clusters of deactivated regions were seen in the medial prefrontal cortex, the temporal lobe and the posterior medial cortex. The sensorimotor cortices, thalamus and occasional paralimbic structures such as the insula and anterior middle cingulate cortex showed activation. The researchers concluded that their results provided additional evidence that acupuncture modulates the limbic-paralimbic-neocortical network. They hypothesised that acupuncture may mediate its analgesic, anti-anxiety, and other therapeutic effects via this intrinsic neural circuit that plays a central role in the affective and cognitive dimensions of pain.</p>