

## Deep Brain Stimulation & Parkinson's Disease

### How does Deep Brain Stimulation (DBS) work?

In summary, there are a number of medical conditions where symptoms in the body occur because of an abnormal activity of the brain. Epilepsy is the most obvious example – abnormal bursting electrical activity in a small area of the brain causes seizures in a patient. If that abnormal area of the brain is deliberately destroyed by a neurosurgeon then the seizures stop and the patient's life can be improved. The difficulty for the surgeon arises in predicting if that area of the brain can be destroyed without hurting the patient. In many cases it can.

Deep Brain Stimulation (or DBS) is a new way of “turning off” or neuromodulating a small area of the brain. It involves placing a small platinum electrode or wire into the abnormal area of the brain. Instead of destroying the area (like we used to do), we use high frequency electrical stimulation to “turn it off”. The electrode is connected by a subcutaneous wire to a pacemaker which sits under the skin, usually in the chest. When electrical pulses are produced by the pacemaker and sent to the tip of the electrode, the brain cells in the region of the electrode are “turned off”.

The pacemaker can then be adjusted to maximize the benefits (turning off the malfunctioning area) and minimize the side effects (turning off adjacent important areas). That is the greatest strength of DBS – it can be adjusted to maximally benefit an individual patient and if there are unwanted side effects, it can be turned down.

Patients with Parkinson's disease have areas of their brain that are overactive and a DBS electrode can be placed in those areas to correct the brain activity. This may be a confusing concept for some because everyone has been told that Parkinson's disease is due to a loss of the dopamine brain cell. Loss of this cell can result in overactivity (or underactivity) depending on whether the dopamine cell was working as a stimulating or inhibiting cell.

### When should one consider DBS?

We reserve DBS surgery for those patients who are having unacceptable side effects from their medications. If you are doing well on your medications, don't have surgery.

### What makes a patient a good candidate for DBS?

We are looking for three motor symptoms that do not respond to optimal medications:

- Motor fluctuations
- Dyskinesia, or
- Tremor

Cont'd...

**Parkinson Society British Columbia**

600 – 890 West Pender Street. Vancouver, BC V6C 1J9

604 662 3240 | 1 800 668 3330 | [www.parkinson.bc.ca](http://www.parkinson.bc.ca)



Last Updated: April 27, 2016

### What is the wait time for DBS in British Columbia?

There are two waiting lists. The first (W1) is the time from when your neurologist puts in a referral for surgery until the time of your neurosurgical appointment. W1 is approximately 2 years. The second (W2) is the time from deciding you want surgery to the day of surgery. W2 is approaching 1 year.

### Is DBS covered by health insurance?

Yes.

### What are the benefits of DBS?

The benefits of DBS are directly related to the surgical target. Targeting the thalamus will reduce tremor approximately 80-100%. Targeting the pallidum will reduce dyskinesia approximately 80-100%. Targeting the subthalamic nucleus will reduce motor fluctuations. The details are best reviewed with your neurosurgeon and, of course, vary from patient to patient.

### Does DBS improve non-motor symptoms?

DBS does not improve the non-motor symptoms of Parkinson's disease. Non-motor symptoms include but are not limited to dementia, depression, loss of smell, constipation, bladder dysfunction, imbalance (this is complicated and can be improved in some), impulse control disorders (also very complicated and can potentially be improved), and REM sleep disorders.

### What are potential complications of DBS?

The rare but devastating complications are stroke or death. In the last 400 patients, we have had no surgical deaths but we have had 0.5% suffer stroke. Our most common complication is infection - all of which have been treated successfully with antibiotics (although a few needed their DBS removed and later replaced). There can be temporary stimulation induced side effects that can be corrected by adjusting the stimulation. These side effects can include personality and behaviour changes. As a result, we will only operate if the patient has a reliable partner who will come with them to the clinic after surgery and report any changes in personality because the patient may not be aware of them (or may enjoy the change too much!).

### Will the benefits of DBS last forever?

The electrodes in the brain will stay forever. The pacemaker will eventually run out of power and need to be changed in approximately 3 years (range 2-7 years). The effects or benefits of the DBS will continue forever, but new symptoms may develop that are not controlled by the DBS. For

**Cont'd...**

#### **Parkinson Society British Columbia**

600 – 890 West Pender Street. Vancouver, BC V6C 1J9

604 662 3240 | 1 800 668 3330 | [www.parkinson.bc.ca](http://www.parkinson.bc.ca)



Last Updated: April 27, 2016

example, if a patient develops dementia years after the DBS surgery, the device will not be able to help this. The patient's quality of life will then deteriorate because of the new dementia, not because the DBS stopped working.

### **Post-surgery, will follow-up appointments happen on a regular basis and can the patient control the device themselves?**

During surgery, the DBS is implanted but left turned off. Patients then return to the DBS Clinic to have the device turned on after 6 weeks. Initially there are weekly appointments to find the best settings. We set safe limits within which the patient or caregiver can adjust the stimulation. Later, we need to see patients every 6-12 months to see how they are doing and plan for the battery replacement as needed.

For more details on how DBS works and who can benefit, visit [www.drhoney.org](http://www.drhoney.org).

#### **Who is a poor candidate for Deep Brain Stimulation?**

1. Those with a diagnosis of an atypical parkinsonian syndrome (eg, progressive supranuclear palsy, multiple system atrophy, dementia with Lewy bodies, corticobasal degeneration, or vascular parkinsonism). These people are often referred for DBS because of poor response to medical therapies but, unfortunately, typically do not respond well to the surgery.
2. People with Parkinson's disease whose primary goals are to improve speech, respiratory and pharyngeal control, postural instability (history of falling), and freezing. Several long-term studies have shown that these dopaminergic-resistant symptoms continue to progress despite changes in stimulation parameters and improvement of other motor symptoms, such as tremor, rigidity, and bradykinesia.
3. People with more than mild cognitive dysfunction, active psychiatric disease, dementia or significant cognitive impairment. This is mostly due to reports of cognition in Parkinson disease worsening irreversibly after deep brain stimulation surgery in patients with pre-existing cognitive impairment. Most centres use detailed neuropsychological testing to screen for dementia.

*Source: Dr. Christopher Honey, Associate Professor of Neurosurgery at the University of British Columbia. He is on the Board of the World Society of Stereotactic & Functional Neurosurgery and the Canadian Neuromodulation Society. Currently, Dr. Honey is the only neurosurgeon in British Columbia qualified to perform Deep Brain Stimulation.*

#### **Parkinson Society British Columbia**

600 – 890 West Pender Street. Vancouver, BC V6C 1J9  
604 662 3240 | 1 800 668 3330 | [www.parkinson.bc.ca](http://www.parkinson.bc.ca)



Last Updated: April 27, 2016