Backgrounder:

Deep Brain Stimulation: A well-proven therapy for treating movement disorders such as Parkinson’s disease, dystonia, and essential tremor

Parkinson’s disease, dystonia, and essential tremor represent a substantial and growing global burden

- **Parkinson’s disease (PD)** is a chronic progressive neurological disorder which affects 6.3 million people worldwide. In Europe, 1.2 million people are affected by Parkinson’s.
- Parkinson’s disease is caused by a shortage of dopamine producing cells, a substance that is used in the brain to transmit signals. Chief symptoms are motor difficulties such as tremor, rigidity, bradykinesia (slowness in movement), and postural instability.
- Given the higher incidence of Parkinson’s disease in those aged 65 or older, the prevalence of Parkinson’s disease is expected to increase as the population ages.
- **Dystonia** is a neurological movement disorder characterised by sustained muscle contractions causing twisting and repetitive movements or abnormal postures.
- The exact cause of dystonia is not fully understood. However, it is believed that the portion of the brain called the basal ganglia, which controls movement, is not functioning properly or has been damaged.
- Dystonia can affect a specific area of the body or be more widespread throughout several muscle groups. These muscle contractions can be painful and interfere with day-to-day activities.
- Dystonia affects more than 500,000 people across Europe, including men, women, and children of all ages and backgrounds.
- Dystonia is chronic but the vast majority of dystonias do not affect other functions of the brain. It is the third most common movement disorder, after Parkinson’s disease and essential tremor.

- **Essential tremor (ET)** is one of the most common tremor disorders and is characterised by a postural and/or kinetic tremor.
- ET can be a progressive disorder. Tremor will typically start on one side of the body, but in time both sides will become affected making it a bilateral disease.
- Average age of onset is between 40-50 years.
- The exact cause for ET is unknown. However, it is believed that certain parts of the cerebellum may be affected. ET is found to be mostly hereditary. Children of a parent who has essential tremor have a 50 percent chance of inheriting the condition.
ET most commonly affects the upper extremities (~90 percent of patients) followed by the head (~30 percent), voice (~20 percent), face or jaw (~10 percent). Head tremor will appear as a “yes-yes” or “no-no” motion. Some ET patients may also show signs of gait.\(^\text{11}\)

There is no cure for these Movement disorders, but their symptoms can be managed

- Pharmacological therapy for Parkinson’s disease, dystonia, and essential tremor is aimed at minimising the motor symptoms of the disease. However, for many patients motor symptoms can no longer be controlled by medication alone – and these symptoms significantly impair daily living and quality of life of those impacted and constitute a high burden on both patients and their caregivers.
- Deep Brain Stimulation (DBS) can help patients to cope with such movement disorders.\(^1\)
- DBS is a surgical procedure used to improve the motor symptoms of Parkinson’s disease, dystonia, and essential tremor.\(^1\)

How Deep Brain Stimulation works

- The DBS procedure entails surgically implanting a modest medical device which sends signals to the brain.
- The physician will place one or two insulated wires called leads in a neural target.
- The leads are then connected to the stimulator (similar to a pacemaker), which is typically placed under the skin in the chest.
- The device produces mild electrical impulses that stimulate a specific region of the brain.
- The stimulation may help regulate neural signaling, resulting in improvement of movement disorder symptoms.
- Although DBS is not a cure, it may help improve day-to-day experiences for patients living with Parkinson’s disease, dystonia, or essential tremor.\(^1\)

Clinical evidence on the effectiveness of Deep Brain Stimulation

The clinical effectiveness and long-term safety of DBS has been well established. Deep Brain Stimulation has been used for over 15 years to treat symptoms of PD that cannot be controlled with medication alone.

- In 2003, the UK’s National Institute for Clinical Excellence (NICE) declared DBS to be a clinically and cost-effective intervention for PD.\(^\text{12}\)
- Similarly, in 2002, France’s Agence Nationale d’Accréditation et d’Évaluation en Santé declared DBS to be an effective therapy for Parkinson’s disease.\(^\text{13}\)
In 2006, the UK’s National Institute for Clinical Excellence (NICE) declared DBS to be a clinically safe and effective intervention for the treatment of dystonia.14

PD and dystonia both have their standard rating scales used by physicians to assess patients’ motor function.

Multiple studies have demonstrated a reduction in UPDRS III scores (Unified Parkinson’s Disease Rating Scale III) which correlates with an improvement in motor function, following Deep Brain Stimulation at six months to five years.15,16,17,18,19,20,21,22

For dystonia, multiple studies have demonstrated a reduction in Burke-Fahn-Marsden Dystonia Rating Scale (BFMDRS) and Toronto Western Spasmodic Torticollis Rating Scale (TWSTERS) scores following deep brain stimulation therapy.23,24,25,26,27,28,29,30,31,32

Deep Brain Stimulation has been proven to be safe and effective for the treatment of limb tremor. Most patients are unilaterally implanted contralateral to the side of the body with the most severe tremor. According to several clinical studies, DBS has demonstrated a mean improvement of 60-90% for ET based on clinical ratings.33

Cost-effectiveness of DBS: a closer look at Parkinson’s and dystonia

Despite the cost of the implantation procedure, reduction in antiparkinsonian medication following DBS leads to overall cost savings at two years post-surgery. In addition to cost savings achieved through medicines reduction, cost reductions are achieved in hospitalisations, consultations, auxiliary care and other medications within six months post-surgery.34

In Parkinson’s, lower drug and direct medical costs combined with improved Unified Parkinson’s Disease Rating Scale (UPDRS) scores make DBS more cost-effective than medical therapy alone. Compared with best medical therapy, DBS demonstrates lower pharmacologic and direct medical costs while improving total UPDRS scores.35,36

Improvement in self-care ability due to DBS reduces the burden on Parkinson’s caregivers – in fact, a study has shown a 57 percent reduction in dependence on caregivers for activities of daily living.24

Despite the cost of the DBS device and surgery, savings are substantial enough to lead to return on procedure investment of €36,904 at 2.2 years post-surgery.23,24,25,26,27,28,29,30,31,32,35,36

In summary, Deep Brain Stimulation has demonstrated long-term efficacy, with symptom improvement seen five years after surgery. The long-term safety of DBS has also been well established.
 References


17 Rodriguez-Oroz MC, Bilateral deep brain stimulation in Parkinson’s disease: a multicentre study with 4 years follow-up, Brain (2005), 128, 2240-2249.


