DEEP BRAIN STIMULATION FOR TREATMENT RESISTENT OBSESSIVE COMPULSIVE DISORDER

INTRODUCTION

Deep Brain Stimulation is a medical treatment developed over the past 20 years for disorder of the nervous system repetitive current at very low voltage for stimulation of voltage in order to disrupt pathological nerve circuits and alleviate symptoms of neurological disease. This is done using surgical insertion under general anaesthetic of very fine wire with an electrode at the tip that can provide the stimulus. This wire is small so that it does not do any damage to the delicate tissue of the brain and similarly it can be removed without damage. This has been made possible by the precise techniques of modern neurosurgery combined with CT/MRI imaging allowing for accurate placement of the electrode. Furthermore recordings of brain signals are made during the operative insertion procedure to further precisely place the tip of the electrode in this exact functional as well as anatomical position.

This technique has been well established in the role of treatment of movement disorders, particularly Parkinson’s Disease Dystonia and essential tremor. This is a highly successful technique used to help over sixty thousand patients in multiple centres around the world. As such very considerable experience with the method, and surgical procedure and it's complications, has been derived over this time.

OBSESSIVE COMPULSIVE DISORDER

Obsessive Compulsive Disorder was a condition that affects 1-2% of the population in varying severity. Frequently onset is in childhood and the course can be intermittent or continuous. It is characterized by recurrent intrusive thoughts, frequently of self doubt or guilt and usually accompanied by repetitive compulsive behaviors. These thoughts and behaviors are often intellectually seen as irrational but never the less the impulses are excruciatingly difficult to resist. The sufferer is often trapped in a state of incapacitating anxiety and unable to efficiently engage in purposeful activity.

Obsessive compulsive disorder can arise co-morbidly with diseases such as Tourette’s Syndrome or secondary to other psychiatric conditions such as a major psychoses.
Coexisting depression is very common presentation and the OCD symptoms are frequently worse when the depression is more severe.

Current treatments use medication and psychological therapies of exposure and response prevention. These treatments however are far from optimal and there have been no new products or advances in the thinking over the past ten years. Medication generally carries significant side effects: weight gain, sedation, loss of libido. These consequences are particularly deleterious on the individual’s life when they persist over many years leading to gross impairment of normal maturational sequences, work capability, relationships, and capacity to integrate into broader society. The psychological therapies are by definition stressful and require a capacity to tolerate anxiety and confront challenges that is beyond many of the more severely afflicted patients.

As such approximately 10% of sufferers of Obsessive Compulsive Disorder prove resistant to conventional treatment. These individuals are left with difficult compromises between barely tolerable medication side effects and incomplete symptom control. Many simply lose hope and disengage from the treatment process. Loss of enthusiasm and optimism in the treating team can arise in the face of intractable symptoms. Within this group there is an enormous cost of ongoing suffering, functional impairment and a burden of care upon their families and other caregivers.

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The use of deep brain stimulation in treatment resistant obsessive compulsive disorder has been demonstrated as a successful treatment in several major European and American centres. Over half of patients derive significant benefit and this is a good response rate in a group of patients who are otherwise refractory to treatment. It must be emphasized that this treatment is not curative but rather reduces the severity and frequency of symptoms to a point where conventional medications and psychological therapies regain their traction.

As such deep brain stimulation is only workable as one part of a suite of treatments applied by the treating psychiatrist or psychologist. This implies for a patient to benefit from deep brain stimulation they require ongoing therapeutic relationship with their treating team.

Approximately 50% of sufferers of treatment-resistant obsessive-compulsive disorder are not appropriate candidates for deep brain stimulation. This would include those under 18 years of age, being currently pregnant, those having a significant current substance abuse problem (other than nicotine) major ongoing psychiatric illness or other medical or surgical issues that could cause surgical complications or unacceptable anaesthetic risks. Willingness to engage in appropriate follow-up care is a significant requirement.

The risks of the process can be divided into three groups: risks of the surgical procedure, device related and psychiatric. The principal risks are the non-specific risks if neurosurgery with approximately 1% rate of significant neurosurgical complications. Complications of infection arise in up to 2% of cases, which usually necessitate removal of the device. These infections have all been superficial, and although it is conceivable that infection could track intracerebrally, I have found no reports of this. These neurosurgical risk factors are well understood as they apply to deep brain stimulation for movement disorders and neurosurgery in general and are minimized in centres with experience with large numbers of patients.
Device related problems are relatively infrequent and usually refer to battery failure. Batteries will run out of power in 1-4 years and will require replacement which is clearly ongoing further surgical exposure and an ongoing cost. The presence of an implanted neuro stimulator means that a high intensity MRI (3 tesla) cannot be used and electro-convulsive therapy and short wave diathermy are contraindicated. There do not appear to be difficulties going through scanners or lower power magnetic fields such as airport security devices etc. Much of this risk is likely to be similar to the experience of cardiac pace makers. The device can be turned off by the patient on such occasions, then turned back on again.

The commonest psychiatric complication is of a transient hypomanic mood. This occurs as a setting-related issue and with appropriate adjustment of device this problem can be managed. There is no evidence of worsening of obsessive compulsive disorder with electrode insertion or stimulus, but the condition can quickly return to original severity if the battery goes flat. There is one report of a suicide in an individual who suffered severe depression as well as obsessive compulsive disorder, after the device had been implanted but it was felt this was not causally related to DBS.

A major issue is one of managing expectations as approximately a third of the patients who undergo this procedure will not have their symptoms relieved.

This treatment is still relatively new, with reports of about 150 cases worldwide. To use a novel and invasive approach, in which the risks and benefits are not yet fully explored, and the longer term consequences are yet to fully unfold, can only be justified with those for whom conventional treatments have definitely failed, and suffering and functional impairment is severe.

As this is a relatively new technique all patients who undergo the procedure with closely monitored to maximize what can be learned and serve to develop understanding of this treatment.

THE TRIAL AT ST ANDREWS

A series of ten patients will be treated at St Andrews Hospital over the next three years. There are two aspects to the research on this. The first one is clinical research wherein the appropriate place for deep brain stimulation within the overall treatment of treatment resistant obsessive compulsive disorder can be further refined. Patients must be thoroughly assessed before the trial and after insertion of electrodes before the neuro-stimulator is turned on, and at regular intervals over the next two years. This will involve a thorough engagement with the patients existing treating team. The second part of the research is basic neuro-science wherein the electrode can record brain electrical signals providing basic scientific data on the relationship of brain electrical activity and psychiatric symptoms and the impact of the neuro stimulation upon this. This is very important basic science that goes towards defining bio-markers of psychiatric illness.

The patients will be in a trial wherein all patients will have no stimulation for two months then the stimulator turned on for half, but after four months all the stimulators will be turned on, so no patient will miss out on treatment in the longer run. Patients and investigators will be blended to stimulate status.

Patients will be closely followed up by the team at St Andrews in conjunction with their treating psychiatrist and psychologist. All patients in the trial can be assured of ongoing...
support and assistance from the team at St Andrews for as long as the stimulator is in place.

The center at St Andrews Hospital in Brisbane is lead by Professor Peter Silburn and Associate Professor Terry Coyne. It is now the 5th largest globally for deep brain stimulation for movement disorders and the largest center in Australia. The St Andrews unit has always had a very extremely active research component and recognition for their role as a world leader in this field. This is done through the Asia Pacific Center for Neuromodulation, a body set up jointly between St Andrews Hospital and the University of Queensland to maximize the research and scientific knowledge available from the patients being treated at St Andrews. All research is conducted with the approval of the Ethics Committee of Uniting Health Care.

Deep brain stimulation for treatment resistant obsessive compulsive disorder is defined as psychosurgery under Queensland Law. Such a procedure can only be done with informed consent. This consent has to be at a high level of understanding about the nature of the procedure, the risks and benefits. All candidates for Deep Brain Stimulation for treatment resistant OCD must be formerly presented to the Mental Health Review Tribunal. A panel of experienced neurosurgeons, psychiatrists, lawyers and a community representative must be convinced of the appropriateness of the procedure in a particular patient, and that informed consent is valid. The patient, then family and any other interested parties are interviewed as part of this process.

The stimulator is powered by a battery, the life of which is variable, but would be expected to be 2-4 years. It is to be understood that the battery will have to be replaced which is a further surgical procedure and general anesthetic at the end of this time, if the stimulator is to remain in position and active.

Deep Brain Stimulation offers the prospect of significant symptomatic relief, in a patient group for whom we are otherwise ineffective before their suffering. The place of the therapy in treatment of OCD is not yet well defined but would appear worthy of consideration in patients who are otherwise treatment-resistant.