

## Neuromodulation: The last available resort for refractory obsessive compulsive disorder

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*Obsessive:* Compulsive disorder (OCD) is an anxiety disorder characterized by intrusive thoughts that produce uneasiness, apprehension, fear or worry (obsessions), repetitive behaviours aimed at reducing the associated anxiety (compulsions), or a combination of such obsessions and compulsions. Symptoms of the disorder include excessive washing or cleaning, repeated checking, preoccupation with sexual, violent or religious thoughts, relationship-related obsessions, aversion to particular numbers and nervous rituals such as opening and closing a door a certain number of times before entering or leaving a room. These symptoms are time-consuming, might result in loss of relationships with others, and often cause severe emotional and financial distress. The acts of those who have OCD may appear paranoid and potentially psychotic. However, people with OCD generally recognize their obsessions and compulsions as irrational and may become further distressed by this realization. OCD is different from behaviours such as gambling, addiction and overeating.

People with these disorders typically experience at least some pleasure from their activity; OCD sufferers may not actively want to perform their compulsive tasks and experience no pleasure from doing so.

*For example:* While a person without OCD might momentarily worry that he or she has forgotten to lock the door, that thought is quickly balanced by the realization that, yes, the door has indeed been locked. For a person with OCD, on the other hand, the thought that the door is unlocked will recur and fall into a repetitive pattern of thinking (obsession) and checking to make sure the door is locked (compulsion).

A number of psychological and biological factors may be involved in causing obsessive-compulsive disorder. Standardized rating scales such as Yale-Brown Obsessive Compulsive Scale can be used to assess the severity of symptoms [1].

Researchers have yet to pinpoint the exact cause of OCD, but brain differences, genetic influences, and environmental factors are being studied. The Nucleus Accumbens is a part of a greater brain network which is involved in motivation and the processing of rewards, and its activity is disturbed in obsessive compulsive disorder, probably explaining why patients are stuck in a pathological behaviour at the cost of healthy one. So, obsessive-compulsive disorder (OCD) is essentially the result of faulty wiring in the brain. It is a disorder of neurocircuitry.

Brain scans of people with OCD have shown that they have different patterns of brain activity than people without OCD and that different functioning of circuitry within a certain part of the brain, the striatum, may cause the disorder. Differences in other parts of the brain and neurotransmitter dysregulation, especially serotonin and dopamine, may also contribute to OCD [2].

Formal diagnosis may be performed by a psychologist, psychiatrist or other licensed mental health professional. To be diagnosed with OCD, a person must have obsessions, compulsions, or both, according to the Diagnostic and Statistical Manual of Mental Disorders. Moreover, the obsessions or compulsions must be time-consuming (taking

up more than one hour per day) or cause impairment in social, occupational, or scholastic functioning. It is helpful to quantify the severity of symptoms and impairment before and during treatment for OCD. Behavioural therapy, cognitive behavioural therapy, and medications are first-line treatments for OCD [3]. Electroconvulsive therapy (ECT) has been found to have effectiveness in some severe and refractory cases [4].

For some; medication, support groups and psychological treatments fail to alleviate obsessive-compulsive symptoms. These patients may choose to undergo psychosurgery as a last resort. In this procedure, a surgical lesion is made in an area of the brain (the cingulate cortex). In one study, 30% of participants benefited significantly from this procedure [5]. Deep-brain stimulation and Vagus nerve stimulation are possible surgical options that do not require destruction of brain tissue. In the US, psychosurgery for OCD is a treatment of last resort and will not be performed until the patient has failed several attempts at medication (at the full dosage) with augmentation, and many months of intensive cognitive-behavioural therapy with exposure and ritual/response prevention.

Deep Brain Stimulation (DBS) is a highly experimental neurosurgical treatment in which the brain is stimulated with electrical impulses. DBS has been used since the mid 1980 to treat the symptoms of movement disorders such as Parkinson's disease. DBS involves placing electrodes in targeted areas of the brain. Once the electrodes are in place, they are connected by wires under the skin to pulse generators under the skin (usually just below the collarbone). The pulse generator, sometimes called an "implantable neurostimulator" contains a battery for power and a microchip to control the stimulation. These pulse generators are similar to pacemakers. The biggest difference is that in DBS the electrodes are in the brain instead of in the heart. [6]. Although it has shown considerable promise in the treatment of movement disorders such as Parkinson's disease, there is a widely reported growing body of evidence that it may be helpful for the treatment of OCD. Electrical deep brain stimulation is a relatively new technique and developed as a treatment for OCD through collaboration between Belgian and Swedish

researchers. In the late 1990's, based on positive research results in anterior capsulotomies, DBS researchers first implanted electrodes in the anterior capsule of treatment-resistant OCD patients. The early results were promising. Three of the first four patients experienced benefit. Since then, larger trials have been done and the target area of the brain has moved slightly to an overlapping part of the brain called the ventral capsule/ ventral striatum (VC/VS). DBS requires opening the skull, but it does not require destroying any brain tissue. DBS allows for different amounts of electrical charge, giving the doctors a wider range of treatment.

The FDA recently approved DBS for treatment-resistant OCD under a Humanitarian Device Exemption (HDE). The HDE approval assumes a relatively small number of patients will receive the treatment. The placement of the electrodes and the decision about how much stimulation is given is crucial. Because DBS for treatment-resistant OCD is a very specialized procedure, it is recommended that treatment be given at institutions that have previous DBS experience. The way in which DBS works is still unknown, but essentially, DBS uses high frequency pulses that have complex effects including blocking of the targeted area and mimics the effect of tissue lesioning without destroying them and it has been suggested that it restores normal activity to areas of the brain that have become dysregulated.

Patients with certain diagnoses in addition to their OCD are not eligible for DBS treatment. These diagnoses include psychotic disorder, bipolar disorder, substance abuse, personality disorder, history of serious suicidal behaviour and cognitive impairment that would affect patient's ability to give informed consent or provide reliable self-report data. Despite widely reported claims that DBS is a safe and reversible procedure, the side effects reported so far suggest extreme vigilance especially as it is not yet established whether DBS is completely reversible. Because DBS involves brain surgery, the procedure may be especially risky, posing some serious health risks.

Also, the brain stimulation itself may cause side effects. Possible surgical complications and adverse health problems associated with DBS include bleeding in the brain, stroke, infection, mood changes such as mania, depression and movement disorders [6]. At this point it appears that DBS needs to continue indefinitely for continued benefit. It is crucial that a psychiatrist with expertise in DBS be directly involved in a patient's care over the months and years following surgery.

It should not be forgotten that DBS procedures lead to the creation of lesions, although these are smaller than for ablative procedures and, in some circumstances, may be temporary. Although there are preliminary reasons to view DBS with considerable optimism as a potentially major advance in the management of severe and treatment-refractory OCD, there are also compelling reasons for caution.

### References

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