

Is deep brain stimulation a treatment option for addiction?

Use of deep brain stimulation (DBS) for refractory substance abuse disorders may not be feasible because of lack of interest and high dropout rates of patients before surgery.

Deep brain stimulation (DBS) is a treatment which directly modulates dysfunctional brain networks in patients with treatment-refractory neurological and psychiatric disorders. Based on animal research and case reports, substance use disorders (SUDs) were recently identified as a possible new indication for DBS [1–3]. We experienced great difficulties with the inclusion of patients for a pilot study that aimed to investigate DBS as a treatment for SUD, leading us to question its feasibility.

The pilot study was launched at the Academic Medical Center of the University of Amsterdam to investigate the feasibility, efficacy and safety of DBS targeted at the nucleus accumbens in eight patients with treatment-refractory cocaine and/or heroin dependence. Patients were recruited via six addiction care treatment centres in the Netherlands that, together, treat more than 27 000 patients annually, including about 5500 heroin and/or cocaine-dependent patients with a treatment history of more than 3 years [4]. To further stimulate participation, a paper about the trial was published in a popular magazine targeting drug users, with 12 000 copies per edition. At the end of the 3-year recruitment period only 23 patients were referred for DBS, and only two patients started the trial. Of the remaining 21 patients, six were not eligible and 15 discontinued the screening procedure—including nine who never showed up for intake. Similar difficulties in recruitment were observed in Cologne, Germany, where one of the only two other registered DBS studies for heroin dependence in the world is currently recruiting patients [5].

A comparison with a DBS trial for patients with obsessive-compulsive disorder (OCD) in the same hospital in Amsterdam with a similar 3-year recruitment period shows, for patients with SUD: (i) a much smaller number of referrals (23 SUD referrals versus more than 100 OCD referrals), suggesting lower interest for DBS in SUD patients and more hesitancy among clinicians to refer patients; (ii) a higher proportion of no-shows for intake (<5 versus 39%); and (iii) a much higher proportion of withdrawals after intake (14 versus 43%).

To gain more insight into the reasons for the high proportions of no-shows and withdrawal after intake in those who were referred, we conducted a standardized

telephone interview with eight of the 15 eligible patients who left the trial before implantation (six were untraceable and one declined to participate). These patients mentioned a variety of reasons, of which fear of the surgical procedure was the most prominent. Interestingly, none of the OCD patients that we screened for DBS in the same period ever mentioned fear of the procedure as a reason to abort participation.

There are a number of possible reasons why the inclusion of SUD patients rather than of OCD patients for DBS is less successful. First, the perceived burden of disease is probably higher and more consistent in patients with OCD than in SUD patients. Whereas OCD is seen as one of the most debilitating disorders (World Health Organization [6]), SUD patients experience the burden as more fluctuating and often deny the severity of their illness [7]. Secondly, and related to the first reason, SUD patients are less motivated for invasive interventions than are OCD patients. The vast majority of OCD patients were unwavering in their wish for DBS throughout the screening procedure, while doubt was expressed by all addiction patients, including the two patients who received DBS. Thirdly, not everyone, including patients and clinicians, recognizes addiction as a medical condition, let alone as a chronic, relapsing brain disorder [8–10]. This is confirmed by studies on the stigma of mental disorders showing that people with alcohol dependence are regarded less frequently as mentally ill and are held more responsible for their condition than are people with other mental disorders [11,12]. Consequently, from that perspective, DBS for SUD may be perceived as invasive, unethical and thus unacceptable, even as a last-resort treatment. This could have contributed to the low number of referrals we received from clinicians (11 versus 12 self-referrals), despite our regular enquiries for possible candidates. Fourthly, compared with OCD patients, SUD patients show more serious social and physical problems, which increases the barrier to apply for DBS and makes them less compliant once an appointment is made [1]. After all, the surgery and the extensive follow-up during DBS require a stable social environment. Only four of the 13 SUD patients with an appointment brought a family member or friend, including both patients who participated in the study and two patients who were not eligible. We learned that the recruitment of SUD patients for DBS required high flexibility from our side, persistence and resourcefulness to meet and stay in contact with the patients. However, despite these

measures, the dropout was very high and the number of referrals was low, indicating that they were not sufficient to attract and include enough patients.

Although our centre in Amsterdam is well experienced and renowned for the treatment of SUD patients and for DBS in patients with OCD and depression, with world-leading experts in addiction and DBS in our team, and although we have an extensive network of referral centers in a country without serious taboos on addiction, we were unable to recruit eight SUD patients in 3 years (there was a similarly low recruitment rate in Cologne: three patients in 2 years). We therefore conclude that DBS for treatment of refractory heroin- and/or cocaine-dependent patients is currently very difficult to implement, and therefore its feasibility should be somberly questioned.

Declaration of interests

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