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EDITORIAL

Stereotactic Neurosurgical Treatment of Addiction: Minimizing the Chances of Another ‘Great and Desperate Cure’

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Over the past 4 years Russian and Chinese surgeons have used neurosurgical procedures to treat heroin addiction. Three hundred and five patients were reportedly operated on in Russia [1] and over 500 in China [2] before the procedure was stopped by the Russian and Chinese governments (in August 2002 and November 2004, respectively).

In China, stereotactic surgery has been used to ablate the nucleus accumbens [3], the brain region where the rewarding effects of many drugs of dependence, including opioids, appear to be mediated [4]. Gao *et al.* [3] found that ablation of this site abolished self-administration of opioids in rats, so they thought it plausible that ablating this area would reduce the rewarding effects of heroin, and thereby decrease the likelihood of relapse after achieving abstinence. In Russia, a different rationale has been used to justify the ablation of the cingulate gyrus, a brain region that has been ablated previously to treat obsessional disorders [5]. In the case of heroin addiction, the aim of surgery is to interrupt obsessional thoughts about drug use [5,6].

How should the addictions field respond to these reports? It is tempting to prefer silence to avoid advertising the procedure and giving its advocates the oxygen of publicity that controversy provides. Unhappily, this is not an option because the procedure has already been described in the medical [3,5,6] and popular media (e.g. [1,7,8]). The addictions field accordingly needs to take more active steps to avoid a therapeutic enthusiasm for neurosurgical treatment of addiction such as that which occurred in the United States, and many other developed countries, with psychosurgical treatment of mental illnesses in the 1940s and 1950s [9,10].

Addiction researchers and practitioners need to articulate clearly and express forcefully the major concerns about the safety, efficacy and ethics of the neurosurgical treatment of heroin addiction [11,12]. The critical audiences are: neurosurgeons, because their expertise is required to perform the procedure; addiction neurobiologists, because their work is being used to provide a biological warrant for this procedure; potential patients and their families desperate for a ‘cure’; and politicians, who may feel obliged to respond to demands from addicts and their families to fund the treatment. We need to put across a number of key messages.

First, there is no compelling reason to use neurosurgery to treat heroin addiction. We have effective forms of treatment that substantially reduce illicit opioid use and stabilize the lives of heroin addicts; namely, maintenance on long-acting agonists, such as methadone, and mixed agonist–antagonist opioids such as buprenorphine [13–15]. Patients and practitioners who find opioid agonist maintenance morally objectionable, or who work in settings that prohibit its use, can use the oral antagonist naltrexone (e.g. [16]). This is an intervention of marginal efficacy because of poor patient compliance [17], although depot formulations of naltrexone that are under trial may improve success rates.

Secondly, there are major concerns about the safety and efficacy of the neurosurgical procedures that have been used to treat addiction. Stereotaxic neurosurgery is an invasive procedure that involves drilling holes in the patient’s skull and inserting electrodes deep into the midbrain to ablate the nucleus accumbens or sever the cingulate gyrus. Advocates of these procedures argue that they are less invasive and destructive than older forms of psychosurgery, and report low rates of complications in uncontrolled studies [3,6]. Much less invasive forms of neurosurgery are now used sparingly in treatment refractory cases to produce smaller, better-targeted lesions, the location of which is verified by neuroimaging (e.g. [18]). None of the procedures performed in China or Russia meet these standards.

Thirdly, there are major concerns about the effects of producing irreversible lesions in neural centres that are implicated not only in drug-mediated reward but in the control of food intake, sexual behaviour and probably a myriad other more mundane daily pleasures. What effect will these procedures have on the person's responsiveness to reward, their motivation, mood state, risks of depression and suicide and capacity for planned action? What will happen if heroin addicts attempt to compensate for the attenuated reward from heroin by increasing their heroin dose to levels that may be lethal in overdose? No attempt has been made to answer these questions, with the published evaluations limited to showing minimal changes on cognitive and personality tests [3,6] which provide, at best, very coarse assessments of adverse effects on personality and cognition.

Fourthly, the published evaluations of the procedures have been uncontrolled case-series using the patients' previous experiences after detoxification as the comparison [3,6]. The false assumption is that detoxification is a treatment of opioid dependence and hence failure to remain abstinent thereafter is an indication of treatment failure. There has not been any attempt to assign patients randomly to an effective comparison treatment, such as opioid agonist maintenance, because this treatment is not permitted in China [19] and prohibited by law in Russia [16]. There has not even been any attempt to compare its efficacy with oral naltrexone, which has been used in Russia, reportedly with better results than in western countries [16].

Fifthly, there are doubts about whether patients have given free and informed consent to participate in this surgery [11]. Chinese and Russian policies towards opioid dependence are punitive, with imprisonment and compulsory detoxification as the first line, and indeed the primary forms of 'treatment' in the absence of agonist maintenance treatments using methadone or buprenorphine. Under these punitive conditions, there are doubts about how freely consent can be given to undergo neurosurgery. Nor can patients be said to provide informed consent when they are offered only ineffective treatment options such as detoxification; and in the absence of controlled outcome studies or preclinical studies of safety, it is unclear how well-informed patients can be about the risks of the procedure to which they are asked to consent.

These concerns will be obvious to most in the addictions field, but we cannot assume that this will be true among neurosurgeons, addicts or the wider community. Nor should we assume that expert views would be accepted by addicts and their families, who may be desperate to achieve abstinence from heroin and other opioids at almost any personal or financial cost. The experience with ultra-rapid opiate detoxification (UROD) in Australia was that addiction experts' criticisms of the procedure were portrayed as preventing access to an addiction 'cure' to protect personal vested interests in the perpetuation of addiction [20].

The addictions field will need to speak with a united voice if we are to ensure that neurosurgical treatment of addiction is not introduced into developed countries by enthusiastic private practitioners without formal evaluation, as purported 'cures' for heroin addiction all too often are. We must also be prepared to face the challenge that may arise if neurosurgical entrepreneurs in developing countries with poorly regulated medical care and punitive policies towards opioid addiction begin to market neurosurgery as an addiction 'cure' via the internet (as happened with UROD), in the expectation that there will be a market for the treatment among addicts and their families in developed countries. If this happens, clear and consistent statements of the case against pursuing this desperate remedy will be required from credible organizations, such as the World Health Organization.

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