Deep brain stimulators and anaesthesia

Editor—Implanted electrical deep brain stimulators are a relatively new treatment modality to combat parkinsonism and certain other movement disorders. Other uses of deep brain stimulation include chronic pain treatment, tremor control in multiple sclerosis and refractory epilepsy. This case report describes a patient with such a device who presented for plastic surgery.

A 70-yr-old female presented on the day of surgery for excision of skin lesions from the scalp under general anaesthesia. She had severe Parkinson’s disease and was confined to a nursing home. She was dysarthric and was unable to provide much history. On examination it was noted that she had an implanted electrical device below the right clavicle and this was assumed to be a cardiac pacemaker. The ECG revealed no pacing spikes and she was referred to the cardiac technicians for interrogation of the device. They had no record of cardiac pacemaker implantation and further investigation revealed that the device was a deep brain stimulator (Itrel II neurostimulator, Medtronic) that had been inserted at another institution for severe leg tremor and rigidity. The patient was unable to provide details and there was no record of it in her medical notes. A preliminary literature search provided no advice on how to manage patients with these devices. It was decided to adopt similar precautions to those taken when surgery is performed in the presence of an implanted cardiac pacemaker. With standard monitoring, anaesthesia was induced with fentanyl 100 μg, propofol 80 mg and cisatracurium 9 mg. The trachea was intubated with a 7.0 mm tracheal tube and anaesthesia maintained with sevoflurane in air and oxygen. The surgeon was advised to use low power, bipolar diathermy in short bursts. Anaesthesia and surgery proceeded uneventfully and the patient woke up with no change in her neurological status.

There is little information on the management of patients with deep brain stimulators who present for surgery. The device consists of a thin coiled wire lead that is implanted stereotactically into the brain, usually the globus pallidus or subthalamic nucleus, for treatment of severe Parkinson’s disease. The lead is tunnelled subcutaneously to a neurostimulator implanted subcutaneously in the anterior chest wall. The electrical pulse generator can be adjusted by a physician programmer or by the patient with a handheld therapy controller or magnet. The Medtronic deep brain stimulator technical manuals state that diathermy and magnetic resonance imaging (MRI) scanning are contraindicated. A further literature search uncovered two cases in which diathermy caused significant brain tissue damage and resulted in the death of one patient. However, the diathermy referred to in the Medtronic manuals and case reports is not surgical diathermy (electrocautery) but shortwave diathermy, microwave diathermy and therapeutic ultrasound diathermy commonly used to provide tissue heating for muscle or joint conditions. Heating can occur at the site of the electrodes and cause severe injury or death even if the neurostimulator is switched off. The terminology is confusing since all these treatments are described as diathermy. Electrocautery may also damage the leads and can cause temporary suppression of the neurostimulator output and/or reprogramming of the neurostimulator. The manufacturers’ advice is to avoid electrocautery. If electrocautery is necessary, bipolar mode should be used. If unipolar electrocautery is essential, the ground plate should be kept as far away from the neurostimulator and leads as possible and positioned so that the pulse generator and leads are not situated between the surgical site and the ground plate.

Anaesthetists may also encounter deep brain stimulators with the use of external defibrillation and MRI. External defibrillation may damage a neurostimulator. However, if it is necessary, the paddles should be as far away from the device as possible and perpendicular to the neurostimulator-lead system using the lowest clinically appropriate energy level. MRI scanning also interacts with neurostimulators. These interactions include heating effects at the electrode, force and torque effects on the metal components, magnetic field induced stimulation in the leads, reprogramming of the neurostimulator and image artifacts and distortion. It is possible to safely perform an MRI head scan on a patient with a deep brain stimulator. The neurostimulator must be switched off and MRI used with appropriate selection of parameters and radiofrequency coils outlined in the specific neurostimulator product manuals to ensure patient safety.

The patient and the patient’s carers in this case report were unable to provide any history regarding this device. The neurostimulator had been inserted in a different hospital from the one into which she was admitted for plastic surgery with no reference to the device in her medical notes. Deep brain stimulators are emerging as a treatment option for refractory Parkinson’s disease and other movement disorders. It is important that anaesthetists are familiar with these devices to minimize adverse events during surgery and to ensure patient safety.

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1 www.medtronic.com/physician/neurology.html
doi:10.1093/bja/aei579