Editorial

Thomas L. Ellis*

Brain Tumor Center of Excellence, Co-Director Deep Brain Stimulation Surgery Program, Department of Neurosurgery, Wake Forest University School of Medicine, USA

As a result of the tireless efforts of Victor Horsely [1] and other neurosurgeons [2], the clinical application of brain lesioning to treat neurological disorders was first explored in the early to mid 20th century. In the 1960's, high frequency stimulation (which had previously been used to localize brain regions for lesioning purposes) was found to have desirable effects in certain neurological disorders [3]. In the 1970's, Cooper used chronic high frequency stimulation of the cerebellum to treat movement disorders and cerebral palsy [4, 5] In 1991, Benabid *et al*. published their results of tremor suppression by chronic stimulation of the ventral intermediate thalamus [6]. Since that time, DBS has become an accepted treatment for selected patients with medically refractory Parkinson's disease, essential tremor, or dystonia. More recently, the use of DBS is being investigated for patients suffering from epilepsy [7] and those with psychiatric disorders such as obsessive compulsive disorder [8], depression [9], and Tourette's syndrome [10]

Despite the obvious beneficial effects of DBS in disorders of the basal ganglia, we still have much to learn regarding the mechanism of action of DBS, the effect on neurons, neurotransmitters and brain networks. We must also continue to evaluate and update our understanding of patient selection, surgical technique and decision making and complication avoidance

In this edition of The Open Neurosurgery Journal, the invited authors provide their valuable experience on a variety of issues related to DBS. Alterman and Tagliati review the selection criteria and analyze their experience with surgical technique and programming for patients undergoing DBS for dystonia. Arle, Zani, and Shils explore their decision making process resulting from the use of microelectrode recording (MER) during implantation of DBS electrodes in the sub thalamic nucleus of 75 patients with Parkinson's disease. They comment on how MER optimizes the placement of DBS electrodes and this effect on overall outcomes in their patient population. Bakay and Smith review the potential complications associated with DBS electrode placement, including venous air embolism, intracranial hemorrhage, infection, seizures, lead fracture, and lead migration and misplacement. They also comment on how the ideal patient selection, the choice of a target, preoperative imaging, MER, and optimal programming can reduce the likelihood of complications. Also in this edition, Riley and Boulis review the preclinical and clinical data supporting the potential use of novel targets for DBS, including the zona incerta, pedunculopontine nucleus and prelemniscal radiations.

*Address correspondence to this author at the Brain Tumor Center of Excellence, Co-Director Deep Brain Stimulation Surgery Program, Department of Neurosurgery, Wake Forest University School of Medicine, USA; Tel (336) 716-6438; E-mail: tlellis@wfubmc.edu

REFERENCES

[1] Tan TC, Black PM. Sir Victor Horsley (1857-1916): pioneer of neurological surgery. Neurosurgery 2002; 50(3): 607-11.

[2] Schwalb JM, Hamani C. The history and future of deep brain stimulation. Neurotherapeutics 2008; 5(1): 3-13.

[3] Ohye C, Kubota K, Hongo T, Nagao T, Narabayashi H. Ventrolateral and subventrolateral thalamic stimulation. motor effects. Arch Neurol 1964; 11: 427-34.

[4] Cooper IS. Effect of chronic stimulation of anterior cerebellum on neurological disease. Lancet 1973; 1(7796): 206.

[5] Cooper IS, Riklan M, Amin I, Waltz JM, Cullinan T. Chronic cerebellar stimulation in cerebral palsy. Neurology 1976; 26(8): 744-53.

[6] Benabid AL, Pollak P, Gervason C, *et al.* Long-term suppression of tremor by chronic stimulation of the ventral intermediate thalamic nucleus. Lancet 1991; 337(8738): 403-6.

[7] Fisher R, Salanova V, Witt T, *et al.* Electrical stimulation of the anterior nucleus of thalamus for treatment of refractory epilepsy. Epilepsia 2010; 51(5): 899-908.

[8] de Koning PP, Figee M, van den Munckhof P, Schuurman PR, Denys D. Current status of deep brain stimulation for obsessive-compulsive disorder: a clinical review of different targets. Curr Psychiatry Rep 2011; 13(4): 274-82.

[9] Andrade P, Noblesse LH, Temel Y, *et al*. Neurostimulatory and ablative treatment options in major depressive disorder: a systematic review. Acta Neurochir (Wien) 2010; 152(4): 565-77.

[10] Sassi M, Porta M, Servello D. Deep brain stimulation therapy for treatment-refractory Tourette's syndrome: a review. Acta Neurochir (Wien) 2011; 153(3): 639-45.

1876-5297/11 2011 Bentham Open