DEEP BRAIN STIMULATION FOR MOVEMENT DISORDER AND VEGETATIVE STATE. TECHNICAL NOTE

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Over 40 000 patients were treated with deep brain stimulation over the world mainly for movement disorders. Stereotactic neurosurgical centers used microelectrode recording or macrostimulation or both methods as a helpful neurophysiologic and neurologic tools for positioning the electrode in the target as subthalamic nucleus (STN), globus palidus internus (GPi) or thalamic nuclei. In our Department for neurosurgery we have done deep brain stimulation for movement disorders on 25 patients and on 11 patients with vegetative state (VS) and minimal conscious state (MCS). We are using macrostimulation only for positioning the electrodes in STN and for other targets we are using only imaging.

The operation was performed under local anesthesia and sedation for Parkinson disease and in general anesthesia for dystonia, vegetative state and minimal conscious state. The target for VS and MCS was determined according to the anterior and posterior commissure shown on T1 and T2 MRI and computed tomography (CT). Contiguous T1 weighted 2-milimeter axial MR images were obtained day before surgery (1,5 T Siemens AG Avanto , Erlangen, Germany). For movement disorder patients the target was selected according to the position of subthalamic nucleus on contiguous T2 weighted 1 mm axial MR images. Leksell coordinate frame G (Elekta AB, Stockholm, Sweden) was fixed to the patient's head with the base ring, which was aligned to Reid's baseline. The CT scan was acquired with 1.5 mm slices after the placement of the Leksell frame. The calculation of the target and trajectory was performed on the Frame Link Planning Stealth Station (Medtronic, Minneapolis, Minnesota, USA). Coordinates from the Schaltenbrand Wahren Atlas were used to approximate the target of centromedial parafascicular nucleus (CM-pf). The length of AC PC line was 27 millimeters and the target was 9 mm posterior to the midcommissural point, 1 mm below the intercomissural line and 3,5 mm lateral to the ventricular wall in a left hemisphere. For positioning of the subthalamic nucleus we used mamilothalamic tract and nucleus rubber defined on T2 weighted MR images as a neuroanatomical marker.

The trajectory was aligned to avoid passing through ventricles and sulci. An 8 mm burr hole was drilled at the entry point determined by the planned trajectory. Blunt 1,5 mm in diameter radiofrequency probe with dynamic impendence monitoring (Elekta AB, Stockholm, Sweden) was passed to a point 3 mm above the target point. Dynamic impedance monitoring was used to detect that the probe did not penetrate the ventricle. The radiofrequency probe was withdrawn and the DBS 3387 electrode (Medtronic, Minneapolis, Minnesota, USA) was immediately implanted down the trajectory. Fibrin sealant was applied to the dural defect around the electrode. The DBS electrode was then secured to the skull with titanium plate.

The postoperative CT scan was obtained with the Leksell frame to confirm the position of electrode. The Leksell frame was removed and the Soletra neurostimulator (Medtronic, Minneapolis, Minnesota, USA) was implanted. From 2008. to 2011. we done 13 patients with PD, four patients with dystonia, 9 patients in vegetative state and two patients in minimal conscious state. The mean follow up of 13 PD patients was 8 months, maximum 2 years and minimum 6 months the UPDRS for off medication and off stimulation was 48,5 and for off medication and on stimulation was 10 we have no postoperative hemorrhage, infection or hardware complication. Two patients in MCS after continuous stimulation during six months of CM-pf nuclei enjoy the life with full recovery of consciousness and most of the higher cognitive functions.