Neurocirugia. 2017;28(Espec Congr):22

Neurocirugía

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The Use of Probablistic Atlases and 3D Printed Frames to Streamline Deep Brain Stimulation Surgery and Expand Indications

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Resumen

Deep Brain Stimulation (DBS) is a well known therapy for the treatment of several neurological diseases. The more common indications include Parkinson's Disease, Tremor and Dystonia. The use of image guidance such as intraoperative CT and MRI has lead some practitioners to offer asleep surgery to select patients. However, the majority of initial deep brain stimulation procedures are performed awake with some combination of microelectrode recording and test stimulation. For many practitioners awake surgery is considered the gold standard for DBS lead placement. Unfortunately, during awake surgery for deep brain stimulator lead placement, it can be difficult to maintain patient comfort without resorting to sedation levels that degrade electrophysiological recordings or limit patient participation.

A key factor in maintaining patient comfort may be reducing awake operative time. The use of 3D printed microtargeting platforms for stereotactic guidance, in conjunction with electrode arrays, may reduce the time of awake operative cases while providing excellent operative results. We examined the operative times for patients who underwent DBS lead placement with standard stereotactic frames and compared those times to patient who underwent DBS placement using the 3D printed microtargeting platform. We found that the operative times were reduced significantly with the use of the 3D printed microtargeting platform. These 3D printed frames also have the advantage of providing the anesthetist with unimpeded airway access in the case of emergency. In the future we feel that the use of 3D printed frames in conjunction with an electrode array and the Probabilistic atlas will expand DBS indications to patients of more advanced age and to patients with greater comorbidities since a shorter operation will be better tolerated.