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Procedure vs. Practice - Exploring the Impacts of Procedural Deviations in Deep Brain Stimulation for Parkinsonism.

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ABSTRACT

INTRODUCTION

Parkinsonism a neurodegenerative condition caused by deficiency of dopamine, and characterized by both motor and non-motor symptoms. It's a progressive loss of dopaminergic neurons in the substantia nigra pars compacta, and accumulation of aggregated alpha-synuclein into intracellular structures called Lewy bodies, within specific brain regions. Traditional drug regimens, although capable of controlling these symptoms, lose their effectiveness over time and can further lead to motor complication such as drug induced dyskinesia. Deep brain stimulation (DBS) is a well-established surgical procedure of choice for patients with PD, potentially improving symptoms by stimulation on the subthalamic nucleus (STN) and the internal segment of the globus pallidus (GPi). (DBS) has a success rate of (80 to 90 percent), The advancements in imaging technology has increased reliance on radiological targeting, bypassing the electrophysiological guidance which comprised the remaining 10 percent of the unsuccessfulness shown by this unusual case.

METHODS

A case of a 51-year-old man diagnosed clinically for Parkinson's disease had undergone ECG, blood tests and MRI to rule out any other causes of Parkinsonism. The patient had undergone CT guided

Deep brain stimulation targeting the sub thalamus nucleus without intra operative electrophysiological confirmation, due to its limited availability in the country. Despite the correct anatomical placement of the electrodes and recurrent follow ups for the first 6 months post surgically, the effectiveness was low, and the patient's condition deteriorated forcing him under high doses of levodopa regimen. A year later, revised DBS surgery was performed by replacing previously installed electrodes with new electrodes under electrophysiological guidance.

RESULT

After the first DBS surgery under CT guidance for the placement of the electrodes, which was the only available approach, the patient had no significant relief from his symptoms. He had to take heavy dosages of Levodopa to manage the symptoms of hypokinesia, tremors, dyskinesias, improper gait and speech which weren't resolved. After the second DBS surgery performed a year later, which was under electrophysiological mapping, The patient appeared well with no signs of tremors, hypokinesia, arthralgia, ataxic/antalgic gait. The patient had no need to continue levodopa and didn't require any other medication.

CONCLUSION

With the ongoing debate among surgeons regarding the necessity of electrophysiological control during (DBS) procedures, some argue that it is not essential. This case underscores its significance, especially in (STN) stimulation. These are extremely small and delicate structures, and even when imaging modalities such as CT and MRI indicate correct electrode placement, this may not always be accurate. Therefore, Electrophysiological guidance plays a critical role for confirming precise electrode localization. Effective DBS surgery relies on the intraoperative verification of accurate electrode positioning. Methods frequently employed for this objective include electrophysiological monitoring, stimulation testing, and imaging during surgery. Many surgeons prefer to perform DBS with MER due to its precision and reliability. As more studies evaluate the outcomes of CT-guided implantations, doubts remain regarding the consistency and effectiveness of these techniques. Ultimately, the symptom-specific precision and accurate nuclear targeting achieved through electrophysiological guidance continues to be vital for ensuring optimal DBS efficacy.

Keywords: Deep Brain Stimulation, Electrophysiological Guidance, Parkinsonism, Subthalamic Nucleus, Electrode Implantation.

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