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Case Report Open Access

Increasing Stimulation Parameters Relieves Acquired Eyelid Apraxia after Deep Brain Stimulation of the Subthalamic Nucleus

Akın Akakın[1]*, Baran Yılmaz[2], Nazıre Afsar[1] and Turker Kılıc[1]

[1]*Department Of Neurosurgery, Bahcesehır Unıversıty School Of Medıcıne, Turkey*
[2]*Department Of Neurology, Bahcesehır Unıversıty School Of Medıcıne, Turkey*

Abstract

Acute ischemic stroke is one of the prominent roots of mortality and morbidity all over the world. Core ischemic regions, penumbral regions and extra penumbral regions occur proximal or distal to arterial occlusion where the margins of ischemia are hyperemic with either one, minimal or no parenchymal damage. Electroencephalography (EEG) and single photon emission computed tomography (SPECT) remains the investigative practices that let economical, noninvasive learning of physiological and pathological actions in the human brain in acute ischemic stroke. Mutually these procedures may detect different patterns resonant of severity, prognosis, and secondary injury allied to acute ischemic stroke. Also, these readings can be intensely linked to cerebral metabolism which is sensitive to ischemia. This review summarizes the EEG and SPECT changes and their limitations in monitoring patients with acute ischemic stroke patients.

Introduction

Deep brain stimulation (DBS) of the subthalamic nucleus (STN) provides an effective evidence-based symptomatic surgical treatment for advanced stages of Parkinson's disease (PD) [1,2]. Optimal hardware programming can be challenging in some cases, as side effects may interfere with stimulation parameters required for sufficient control of motor symptoms [3,4]. Eyelid Apraxia, defined as inability to voluntarily initiate opening of eyelids [5], is one of limiting adverse effects which has been reported in 1.8 to 30% of the patients after STN DBS and management of the eyelid apraxia event was mainly relied on medical treatment [6-8].

Here, we present a case of PD patient exhibiting clinical features of eyelid apraxia after STN DBS, which had improved well by adjusting the stimulation parameters with sufficient control of motor symptoms without changing medical regime.

Case

A 80 years-old women with Parkinson Disease was planned to undergo bilateral STN-DBS. After magnetic resonance imaging (MRI), stereotactic frame (Integra CRW) was placed onto the patient at the day of the surgery and Computer Tomography (CT) was done. Later, both images were auto-fused to target the anterior lateral side of left STN and right STN by image fusion programme (Atlas Integra Software). We have done bilateral micro-recording test (Alfa Omega Micro Recording System) and during macro stimulation test, we have observed some facial and eye muscles effects. After that we decided to pull micro-electrode 1 mm above to target. Then, we selected our targets for both sides and sent DBS electrode lead (St. Jude Medical 6149 40 cm lead) bilaterally to STN anterior lateral sides. Finally, we implanted impulse generator (St. Jude Medical Libra XP 6644) and connected to DBS electrode leads.

The day after the surgery when the implanted impulse generator was switched on, we observed that the patient was not able to open her eyes. There was no change in the preoperative drug regime and it was resumed. As the situation of the patient did not change, we decided to start adjusting stimulation parameters.

During the first postoperative week, the pulse width, frequency and amplitude of impulse generator was increased stepwise (Table 1). At the end of the 1st week after the surgery, we changed the stimulation parameters until very remarkable differences was observed and she was already able to open her eyes and look at around consciously.

Discussion

The bilateral subthalamic nucleus stimulation has some known side effects as hypophonia, dysarthria, dyskinesia and eyelid apraxia. Eye lid apraxia is a non-paralytic motor abnormality characterized by difficulty in initiating opening of the eyelids [7,8]. Premotor control of lid-eye coordination by extrapyramidal and mesencephalic circuitries has been suggested and dopaminergic involvement was further substantiated by analysis of blinking rates in patients with PD [9]. Regarding the pathogenesis of eyelid apraxia, the distance from subthalamic nucleus to optic tracts, substantia nigra and red nucleus is only 3 mm which is very close. This region can be affected during micro recording and stimulation period of the surgery [10].

Postoperative eyelid apraxia incidence has been reported between 1.8% and 31% [6,8]. Regarding the management of eyelid apraxia seen

Daily Trials	Stimulation Parameters	DAY-1	DAY-3	DAY-5	DAY-6	DAY-7
TRIAL-1	*P.W. (uS)*	65	98	117	117	117
	Freq. (Hz)	130	130	140	150	170
	Amp. (mA)	2.0	3.0	4.0	4.0	4.0
TRIAL-2	*P.W. (uS)*	98	117	117	117	117
	Freq. (Hz)	130	130	150	160	180
	Amp. (mA)	2.5	4.0	4.0	4.0	4.0

Table 1: Stimulation Parameters From the Postoperative Day-1 To Day-7.

***Corresponding author:** Akın Akakın, Bahcesehır Unıversıty School Of Medıcıne Neurosurgery, Medıcal Park Hastanesı E-5 Uzeri 23 Nısan Sok. Merdivenkoy Istanbul, 34742 Turkey, Tel: +905353162693; E-mail: drbaranylmz2013@gmail.com

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either during the course of the disease or after STN DBS, increasing levodopa dosage, botulinum toxin A injections and adjusting stimulation parameters are all proposed as effective methods [6,11-14].

In our report, eyelid apraxia of the patient improved well by increasing stimulation parameters together with sufficient control of tremor and no change in bradykinesia or rigidity. Without any change the medical regime and/or any invasive intervention, the stimulation parameters had been adjusted and increased throughout the first postoperative week. All combinations of contacts are described well in Table 1. The patient could open her eyes and look at around consciously at the end of the first week after increasing the frequency values. In the long-term follow-up, we planned not to keep the stimulation parameters at these values. However, in our first attempt to decrease the frequency, the symptoms re-emerged. Hence, we postulated that the frequency was the determinant in each adjustment trial periods. The expected battery life is 6 year long from the day set with; Pulse Width: 91 uS Frequency: 180 Hz, Amplitude: 3.0 mA parameters bilaterally.

Conclusion

When dealing with eyelid apraxia after STN DBS, postoperative modification of stimulation parameters may be beneficial as a way of treatment before attempting other management trials.

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