Pallidal Deep Brain Stimulation and Intraoperative Neurophysiology for Treatment of Post-Stroke Hemiballism

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Background

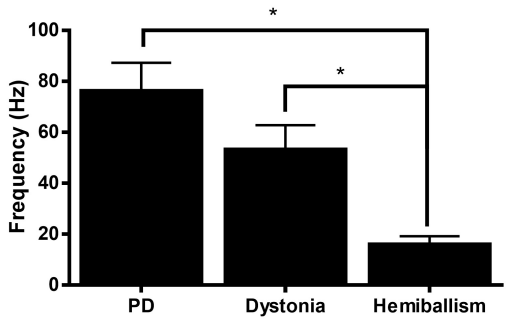
Deep brain stimulation (DBS) is an established therapy for a variety of refractory movement disorders including Parkinson's disease, Dystonia and essential tremor. Movement disorders after strokes are uncommon, but post-stroke dystonia and hemiballismus have been reported (Mehanna et al. 2013).

Post-stroke hemiballism commonly resolves spontaneously but in rare occasions, remains severe or refractory to medications. In this report, we examine a case of refractory hemichorea-hemiballismus (HC-HB) secondary to a thalamic cerebral infarction and report the clinical outcome at 16 months after treatment with globus pallidus internus (GPi) DBS. Additionally, we utilized this unique opportunity to asses basal ganglia intraoperative neurophysiology in this syndrome.

Methods/Case Presentation

- The patient is a 53-year-old woman presenting with insidious and progressive, left arm abnormal involuntary movements starting in her 30s after a right thalamic small vessel disease stroke
- Patient was status post a left shoulder replacement with limited ROM in that shoulder. The left shoulder was fixed but there was high irregular flinging movement of the forearm and wrist. These movements were not suppressible or distractible.
- Due to the severity and disability of her symptoms over the following decades, she underwent unilateral GPi-DBS.
- Single-unit neuronal activity recordings in the GPi were obtained using intraoperative microelectrode recordings

GPi Firing Frequency



Results

Neuronal firing frequency in the GPi:

The mean firing rates in the GPi were 76.30± 9.00 Hz in Parkinson's Disease, 53.32 ± 5.46 Hz in generalized dystonia, and 16.00 ± 3.18 Hz in our HC-HB patient. GPi neuronal frequencies were significantly decreased in our HC-HB patient when compared to that of PD and dystonia ($p<0.001$).

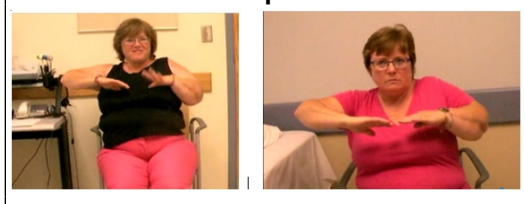
Bursting Indices:

Comparison of bursting indices between our HC-HB patient to that of PD and dystonia patients were not significant

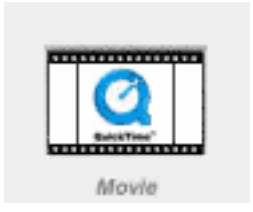
Improvements in Hand Motor Control

Improvements in coloring activity at A) 3 months and B) 12 months post GPi-DBS

Pre and Postop Examination



Left photo shows irregular movements in the left hand and wrist. The right photo shows improvment in the flinging motions.



Conclusions

- We report the successful treatment of medically refractory HC-HB with unilateral GPi DBS secondary to a thalamic stroke and provide additional brain neurophysiologic data in this rare syndrome.
- Although the benefit of DBS in secondary forms of dystonia or parkinsonism (including stroke) is limited, our patient's excellent clinical outcome highlights the potential benefit of DBS in patients with secondary HC-HB despite long duration of symptoms.

References

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