Bilateral GPI Deep Brain Stimulation for Tourette Syndrome

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ABSTRACT

OBJECTIVE: To describe the response of a medication-refractory, 16-year-old male with severe Tourette syndrome (TS) to bilateral GPI stimulation in the treatment of severe TS.

METHODS: Pre-surgical neuropsychological, psychiatric, and neurological evaluations were used to determine suitability for DBS including clinical interview, Yale Global Tic Severity Scale (YGTSS), Clinical Global Impression (CGI), and Videotape Rating Scale (VRS). Behavioral Assessment System – Child (BASC) and other behavioral and quality of life measures (SF-36). YGTSS, TSSR, and the clinician’s global impression were used to determine need for stimulation adjustment every 2 weeks. Comprehensive clinical follow-up was performed 2 months after initial DBS programming. RESULTS: YGTSS, TSSR, and CGI were improved at baseline compared to pre-op. At 2 months, YGTSS, TSSR, and CGI were at baseline levels at 6 months.

CONCLUSIONS: Based on a single case, GPI DBS may be considered safe and effective in severe TS.

INTRODUCTION

Tourette syndrome (TS) is characterized by vocal and motor tics, along with varying degrees of psychiatric/co-morbidities including attention-deficit/ hyperactivity disorder (ADHD), obsessive-compulsive disorder (OCD), anxiety, depression, and oppositional defiant disorder, amongst others (Parker, 1999). The majority of patients experience significant motor tics, compulsive behaviors, and obsessive-compulsive behaviors (Parker, 1999), although many will have mild, persistent tics and OCD with few symptoms (Parker, 2003). In children, TS is a dramatic, debilitating worsening of symptoms that may persist into adulthood (Parker, 2003). Recent years have seen growing interest in the management of neuro-psychiatric conditions with deep brain stimulation (DBS) (Epelbaum et al., 2006). Several cases of marked improvement of severe TS symptoms have been reported with DBS (Table 1).

Here, we describe our results for an experience with GPI DBS of the bilateral globus pallidus internus (GPI) in a 16-year-old male with severe, medication-refractory TS.

METHODS

The GPI was chosen as the target for the following reasons: increased parvalbumin-containing neurons in the GPI of TS patients is associated with an increase in GPI volume (Park et al., 2002). Irregular firing patterns in the GPI of TS patients have been observed. The GPI has connections to the prefrontal cortex (PFC), an area that influences cognitive and motor function (Trachtenberg et al., 1995; Mattfeldt and Strick, 2003). 

Pre-surgical neuropsychological, psychiatric, and neurological evaluations were performed to determine the patient’s suitability for the procedure, including: Behavior Assessment System – Child (BASC) – to assess behavioral and psychiatric symptoms; Yale Global Tic Severity Scale (YGTSS) – to assess behavioral and psychiatric symptoms; Motor tics: The孩子 Tic Rating Scale (MTS); Videotape Rating Scale (VRS); Children’s Yale-Brown Obsessive-Compulsive Scale (CY-BOCS); SF-36 to assess quality of life. 

METHODS

The patient was followed at 2 week intervals. Tic rating scales and the clinician’s global impressions were used to determine the need for adjustment of stimulation parameters. All rating scales were re-administered at 2 and 6 months (CY-BOCS and verbal fluency were only assessed at baseline and 6 months). Videotape assessments (VRS) were rated by a blinded, independent rater.

RESULTS

Onset of tics, obsessive-compulsive behaviors, anxiety, and OCD behaviors were noted, including pushing on the IPG site, which initially required the use of a body shield to protect the apparatus from damage and the patient from SIBs. There were no adverse effects except for mild dysphoria but verbal fluency was at baseline levels at 6 months.

Table 1. DBS parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline</th>
<th>2 mos</th>
<th>6 mos</th>
<th>12 mos</th>
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<tbody>
<tr>
<td>YGTSS</td>
<td>165</td>
<td>135</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>TSSR</td>
<td>90</td>
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<tr>
<td>SF-36</td>
<td>120</td>
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<tr>
<td>TMS</td>
<td>140</td>
<td>145</td>
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</tr>
</tbody>
</table>

CONCLUSIONS

Based on a single case, GPI DBS may be considered safe and effective in severe TS.

REFERENCES


VIDEO LEGENDS

Segment 1. The patient is shown at baseline exhibiting a severe screening and touching tic, along with coproposias. The patient and his mother describe the impact of the tics on their quality of life.

Segment 2. At 6 months follow-up, the patient and his mother describe a dramatic reduction in his severe motor and vocal tics, and a significant improvement in their quality of life. He no longer motor tic on examination.