Deep Brain Stimulation in Young Children: Technical Challenges and Long-term Assessment of Lead Location

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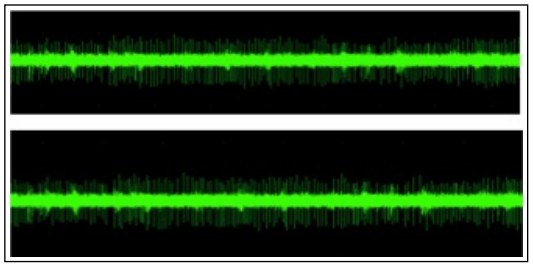
Introduction

Deep brain stimulation (DBS) is a well-established treatment method for certain movement disorders. To date there is less data in the current literature that explore DBS lead location over long term follow up.

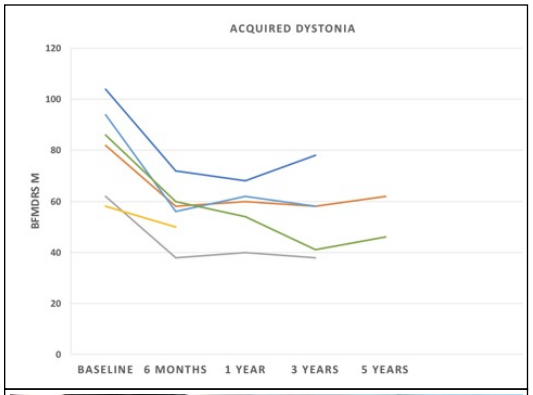
Methods

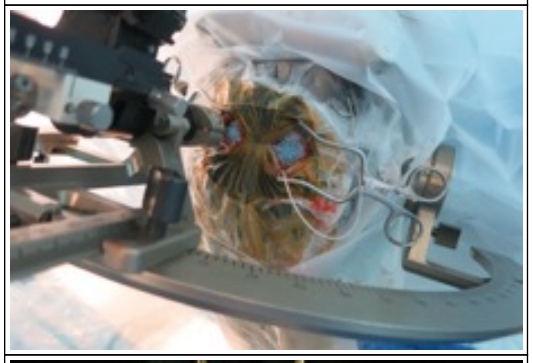
A retrospective analysis of a group of patients who underwent DBS for different types of movement disorders was carried out between the period of January 2011 and June 2016. The DBS was implanted for all patients utilizing standardized surgical techniques and intraoperative neurophysiological monitoring under general anesthesia. The outcome was assessed using the Burke-Fahn-Marsden Dystonia Rating Scale movement subscore (BFMDRS-M). Follow up assessment of the lead location within the target were done using CT brain and electrodes stimulation induced side effects distance measurement.

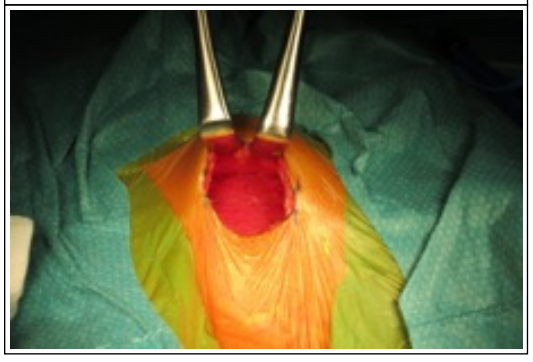


Results

A total of 16 consecutive young children (females 6, males 8) underwent DBS implantation for secondary dystonia (No. 10), primary dystonia (No.1), chorea (No.1), choreoathetosis (No. 3), and Woodhouse-Sakati Syndrome (No.1). The age was ranging between 5 and 13 years old (mean 8.2 years). The follow up period was ranging between 7 and 38 months. Postoperative improvement was 30-60% using BFMDRS-M in secondary dystonia, 80% in primary dystonia, 40-70% in choreoathetosis and chorea, and 50% in Woodhouse - Sakati syndrome. DBS was implanted in different targets that include GPI, zona incerta, and thalamus. Multitargeting method was used in 4 patients. One patient developed infection, which was treated with unilateral partial system removal and antibiotics and one patient developed Twiddler syndrome that required distal system revision. No lead upward migration from the targets was seen over, 3, 4, and 5 years follow up.



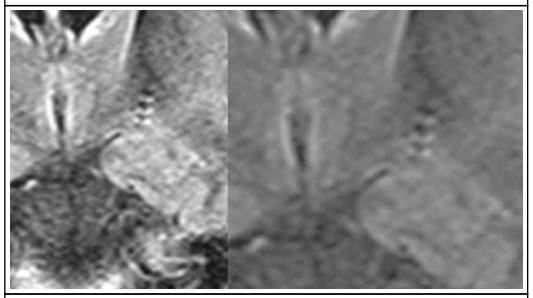


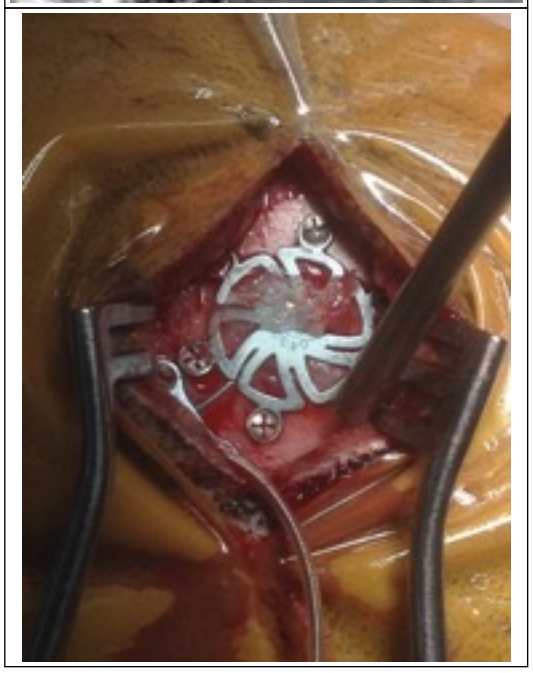


Conclusions

This study showed that DBS improves functional state in various types of movement disorders in young children below that age of 14 years. The best response to DBS was seen in primary dystonia and chorea. No lead migration overtime has been identified.

Dystonia Etiology	NO. of patients	BFMDR-M Pre-op	BFMDRS-M Post-op
Dystonia DYTI	1	96	14
Acquired Dystonia	6	83.7 ± 21.4	59.2 ± 12.7 (5 pts)
NBIA (PKAN)	2	94 ± 9.3	52 ± 8.1
Idiopathic Dystonia	2	98 ± 6.2	56 ± 14.8





Learning Objectives

1. To assess DBS benefits and potential side effects in children below the age of 14 years?

2. To assess the technical challenegs during implantation?

3. To evaluate for the possibility of lead migration due to children growth process overtime