

## Case report

## Anesthesia Considerations in Surgical Deep Brain Stimulation for Tourette Syndrome Management: a Case Report

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### Abstract

Tourette's syndrome (TS) is a neuro-behavioral disease associated by phonic and motor tics with a high frequency of psychiatric co-morbidities. For these cases, deep brain stimulation (DBS) is a developing neuro-modulated treatment option since the first report on a successful surgery in 1999. A male thirty-one years old (77 kg, 178 cm) with diagnosis of Gilles De La Tourette syndrome admitted to neurosurgery ward. His medication included Aripiprazole, pimozone, buspirone, clomipramine, citalopram, phenytoin, Desmopressin and Lithium. The patient underwent implanting DBS (Deep Brain Stimulator) surgery and battery implantation in two steps with two weeks interval. General anesthesia with considerations and according to behavior of disease and drug interactions was performed. The cause and symptoms may be due to central dopaminergic hyperactivity or anomalous dopamine neurotransmission and interventions and anesthesia should be done considering these abnormalities.

**Keywords:** Gilles de la Tourette syndrome, Deep Brain Stimulator, Anesthesia

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**Please cite this article as:** Khorasanizadeh S, Saeedi N, Javadian H, Jalil-Khoshnood R, Zali A, Mohseni G, et al. Anesthesia Considerations in Surgical Deep Brain Stimulation for Tourette Syndrome Management: a Case Report. *J Cell Mol Anesth.* 2020;5(2):114-6.

### Introduction

Tourette's syndrome (TS) is a behavioral and neural disease associated by phonic and motor tics with a high frequency of psychiatric sign and symptoms like attention and activity co-morbidities, autism and impulse control (1). The onset is primarily in childhood and the symptoms may disappear or necessitate with pharmacological therapies linked with cognitive-behavior therapies (2).

Although symptoms usually diminish by adulthood, some of patients continue to experience symptoms during life that in severe cases fail to respond to standard medical and behavioral therapies (3). For these cases, deep brain stimulation (DBS) is a

developing treatment option since the first report on a successful surgery in 1999 (4). Deep Brain Stimulation (DBS) is a surgical modality used to implant a electrical signal generating device; used to send its output to "brain areas responsible for body movements". Electrodes are placed deep in the brain and are connected to a stimulator component. Similar to a heart pacemaker, the device uses electric pulses to regulate brain activity.

The way in which DBS acts has not been completely known yet. Many theories in explaining effects on basal ganglia and connected circuits have been proposed (2).

The main criteria for DBS Indication for GTS patients are almost clinical severe tic and significant

symptoms, even on multi different drugs prescriptions (5):

- alpha adrenergic agonists
- dopamine antagonists
- drugs such as clonazepam, tetrabenazine

## Case Report

A thirty-one years old male (77 kg, 178 cm) was admitted to the neurosurgery ward with diagnosis of Gilles De La Tourette syndrome. An informed consent form from publication of the study was obtained for the patient; the process of case presentation was approved by Institutional Research Ethics Committee, Research Deputy, SBMU, Tehran, Iran; IRB ethics code: IR.SBMU.RETECH.REC.1399.361.

He was taking medication for GDT for 23 years but with no improvement in his symptoms and still had facial and ocular tics. His medication included Aripiprazole, pimozide, buspirone, clomipramine, citalopram, phenytoin, Desmopressin and Lithium. The patient had DI (Diabetes insipidus) in his history probably due to lithium use. The patient's consciousness and body temperature (37.1°C) was normal. Physical examination showed normal cranial nerve function and normal upper & lower motor tone and force and other systems were also normal. He had normal vital signs. The cardiology consultation and echocardiography was reported within the normal range with left ventricular ejection fraction of 55%. The patient underwent implanting DBS surgery and battery implantation in two steps with two weeks interval.

**Anesthetic Implications:** The patient was scheduled for surgery to implant DBS under general anesthesia. Basic and some of the advanced monitoring devices including electrocardiogram, heart rate, Noninvasive and invasive blood pressure monitoring, peripheral pulse oximetry, cerebral oximetry, anesthesia depth (using BIS: Bispectral Index) and electromyography were instituted. Anesthesia management included Fentanyl (200 µg), Midazolam (1 mg), Lidocaine (100 mg) and Propofol (100 mg). Atracurium was administered (50 mg) and then orotracheal intubation was done. Metoclopramide prescribed for

Postoperative nausea and vomiting prevention.

Anesthesia maintenance included Propofol infusion (4-6 mg/kg/h), Oxygen plus air (50/50; 3 liters each) and Atracurium bolus doses of 5 mg as needed. Keeping end tidal CO<sub>2</sub> (ETCO<sub>2</sub>) at 30-35 mm Hg, the patient was observed in a sophisticated approach considering the hemodynamic fluctuation and maintenance of adequate depth of anesthesia (BIS: 40-60). Phenylephrine, epinephrine, atropine, TNG, labetalol and sodium bicarbonate were available to treat hemodynamic disturbances if happens intraoperatively. Indirect medications for increasing BP (ephedrine) were avoided due to the concomitant use of Dopaminergic agonist agents. Aripiprazole affects renal function; Lithium induces Diabetes insipidus, hyponatremia, and other electrolyte imbalances, so fluid therapy was modified and renal function profile and electrolytes were checked before, during and after the surgical procedure.

Phenytoin prolongs QT interval, which make cardiac monitoring more important, and avoidance of other medication with QT prolongation as if Ondansetron is mandatory.

Surgical procedure ended after 45 minutes. The muscle relaxant (Atracurium) was reversed with Neostigmine and atropine, the patient was extubated uneventfully, and patient was discharged after 3 days without neurological deficits.

## Discussion

Patients with Gilles de la Tourette syndrome due to nature of the disease and their medications may be a challenge to the anesthesiologist. The cause and symptoms may be due to central dopaminergic hyperactivity or anomalous dopamine neurotransmission. Haloperidol, olanzapine, risperidone, clonazepam, pimozide, calcium channel blocker, SSRI (selective serotonin reuptake inhibitors) and penfluridol may described for their treatment (6).

The anesthesiologist should consider nature of the GDT complications and all medications, which used by patient that might affect anesthetic agents dose adjustment, fluid therapy and required extra monitoring. Each medication they receive such as Dopaminergic receptor inhibitors (Aripiprazole and Pimozide) or alpha-adrenergic antagonist (Pimozide) require anesthetic agent's dose adjustment and more

consideration than usual.

Intraoperative events like hypertension are common complications that can be correlated to poor perioperative patients' anxiety control or agitation during the procedure; even more, they can be secondary to other events like uncontrolled intraoperative hypertension that might lead to intracranial bleeding (7). Arterial blood pressure monitoring can show beat-to-beat blood pressure variation and is useful to prevent Blood Pressure fluctuation's adverse consequence.

According to their medications, post-operative considerations for PONV and pain management are important. Metoclopramide with potent dopaminergic blocking effects, is a common choice as antiemetic agent (8). Metoclopramide is a selective D<sub>2</sub> antagonist while most of the antipsychotic medications are D<sub>1</sub> and D<sub>2</sub> antagonists receptors that could clarify the helpful antiemetic effects of metoclopramide in GTS (6).

## Conclusion

Our main purpose of this case report was to review general goal and features of perioperative management of Gilles De La Tourette Syndrome; including throughout the surgery and during anesthesia. Anesthesiologist must not only consider the innate features of the disease but also more importantly, be cautious about perioperative drug remedies administered to the patient and the potential untoward interactions with anesthetic drugs.

## Acknowledgment

We would like acknowledge all the physicians, nurses, and the staff, Department of Anesthesiology and the Operating Room, Shohadaye Tajrish

University Affiliated Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran for their kind support and help.

## Conflicts of Interest

The authors declare that there are no conflicts of interest.

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