Case Report

Anaesthetic management of shoulder arthroscopic repair in Parkinson's disease with deep brain stimulator

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ABSTRACT

We describe the anaesthetic management of arthroscopic repair for complete rotator cuff tear of shoulder in a 59-year-old female with Parkinson's disease (PD) with deep brain stimulator (DBS) using a combination of general anaesthesia with interscalene approach to brachial plexus block. The DBS consists of implanted electrodes in the brain connected to the implantable pulse generator (IPG) normally placed in the anterior chest wall subcutaneously. It can be programmed externally from a hand-held device placed directly over the battery stimulator unit. In our patient, IPG with its leads was located in close vicinity of the operative site with potential for DBS malfunction. Implications of DBS in a patient with PD for shoulder arthroscopy for anaesthesiologist are discussed along with a brief review of DBS.

Key words: Deep brain stimulator, Parkinson's disease, shoulder arthroscopy

INTRODUCTION

Deep brain stimulators (DBS) are increasingly used to treat carefully selected cases of movement disorders, pain, and psychiatric disorders that respond poorly to medical therapy.[1] Anaesthesiologist may be involved in the implantation procedure or more frequently when these patients present for non-related medical or surgical illnesses. Patients with long standing Parkinson disease (PD) with DBS for surgery pose significant challenges to the anaesthesiologist in view of primary pathology, multisystem involvement, potential drug interactions, and risk of DBS malfunction by interference with monitoring and therapeutic electromagnetic devices. On reviewing the literature, we did not find any published report of shoulder arthroscopic surgery in a patient of PD with DBS and report the same.

CASE REPORT

Fifty-nine-year-old female presented to our hospital for arthroscopic repair of rotator cuff tear of right shoulder caused by a fall. She was a known case of PD since last 20 years with the history of slowing of movements, stiffness, speech disturbance, and tremors controlled only after the implantation of DBS 8 years back. She gave the past history of snoring, mild gastro-oesophageal reflux, depression, laparoscopic cholecystectomy, and three surgeries related to DBS. Her medical therapy included tablet L-dopa plus carbidopa, bromocriptine, clonazepam, escitalopram, and trihexyphenidyl. Patient weighed 80 kg, 155 cm tall (body mass index 32 kg/m^2) with a mouth opening of 4.5 cm, removable complete artificial denture, Mallampati grade 3, limited neck extension, and a thyromental distance of 6.2 cm. Her pulse rate was 96/min, noninvasive blood pressure (NIBP) 135/84 mmHg, breath holding time 20s, and chest auscultation was normal. Examination of central nervous system revealed cog-wheel rigidity, short shuffling gait, and mild tremors. Haematological and Biochemical investigations, electrocardiogram, and echocardiogram were within normal limits. Chest radiograph showed IPG with leads of DBS on the left side, which was otherwise normal [Figure 1]. She

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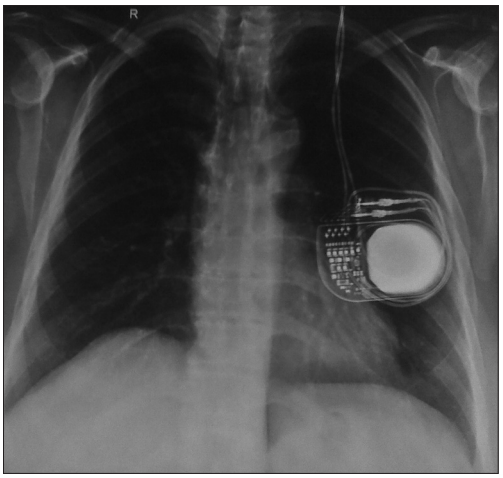

Figure 1: Preoperative chest X-ray shows the implantable pulse generator with its leads

was assessed by a neurologist, DBS was interrogated, a procedure where battery life and device settings are evaluated and manipulated noninvasively. DBS status was acceptable. She was taken up for shoulder arthroscopy with informed high risk consent in view of long standing PD and DBS, kept nil per oral after midnight, and advised to continue all her medications till the morning of surgery along with tablet ranitidine 150 mg. Operation room (OR) and drugs were prepared; difficult airway cart was kept ready. After placing standard monitors we gave iv midazolam 1 mg and oxygen by facemask. Right-sided brachial plexus block by the interscalene approach using a peripheral nerve stimulator (PNS) was given using 21G, 50 mm insulated PNS needle with 25 ml of 0.25% bupivacaine after eliciting contraction of muscles at and below shoulder at a current of 0.4 ma. After observing for 10 min, she was placed in ramp position; general anaesthesia was induced with iv fentanyl 100 μg, propofol 100 mg, vecuronium 8 mg and trachea was intubated. Patient's neck circumference was measured. DBS was turned off by a trained personnel. Patient was placed in left lateral position taking care to pad all the pressure points including DBS skin site, eye, and breast care. Anaesthesia was maintained with nitrous oxide (50%) and isoflurane (0.6-0.8%) in oxygen, iv fentanyl and vecuronium. Her baseline heart rate was 80 beats per minute (bpm) and remained between 68-80 bpm throughout the procedure. Baseline BP was 140/80 mm Hg, SBP was maintained between 110-140 mm Hg, DBP was maintained between 66-84 mm Hg intraoperatively. Thirty minutes after the onset of surgical procedure, patient's BP rose to 190/90 mm Hg which was controlled with nitroglycerine infusion (0.7-1 μg/kg/min) after ensuring adequate analgesia and muscle relaxation. Postinduction iv dexamethasone 8 mg for prophylaxis of PONV and diclofenac sodium 75 mg was administered towards the end of surgery. Blood loss was minimal. Surgeons used 26 1 (litres) of normal saline for irrigation of shoulder joint using arthroscopic infusion pump at a pressure of 70 mm Hg. Arthroscopic repair and subacromial decompression lasted 1.5 h. Before closure of arthroscopic ports, fluid was vented out. After turning the patient supine, neck circumference was measured and was same as preoperatively. DBS was turned on by the trained personnel, reprogrammed to its original setting was functional. At return of spontaneous respiratory efforts, neuromuscular blockade was reversed and trachea was extubated. Patient was conscious, haemodynamically stable and followed verbal commands with a visual analog score of 4 for pain. Postoperative analgesia was provided with intravenous paracetamol infusion 1 gm. Antiparkinsonian medications were resumed 4 h after surgery. Patient had an uneventful hospital stay and was discharged on the fifth day postoperatively.

DISCUSSION

Fifty-nine-year-old lady with PD with DBS *in situ* with complete rotator cuff tear was successfully managed using general anaesthesia with interscalene approach of brachial plexus block for arthroscopic repair. In contrast to the neurodestructive procedures practiced earlier like thalamotomy and palladotomy, the DBS offers the advantages of reversibility, adjustability, nondestructive nature, and long-term treatment. The high suppressive frequency (130-180 Hz) of DBS suppresses the overactivity in the pallidum, subthalamic nuclei or thalamus in PD patients.[1] When these patients present for coincidental surgery, functionality of DBS should always be assessed in the preoperative period, precautions should be taken to prevent DBS malfunction intraoperatively and its function should be reassessed postoperatively.[2] Technical problems such as wire breakage, migration after insertion, Twiddler syndrome (malfunction of a device due to manipulation of either implantable generator or pacing leads) should be ruled out.[3]

Shoulder arthroscopy for the rotator cuff tear requires expansion of glenohumeral and subacromial area by irrigating large amounts of fluids for good visualization. As the subacromial area is uncapsulated, it communicates well via various anatomical planes to the soft tissues of the neck and chest with the risk of fluid extravasation into these areas. It can

even cause external compression on the larynx and trachea with life-threatening airway obstruction.[4,5] In our patient, DBS battery with its leads was located in close vicinity of the operative site. In the absence of the published literature, as an added precaution to prevent DBS malfunction we decided to switch off the DBS after inducing the patient to sleep as she had disabling tremor that was physically and psychologically distressing in the absence of DBS. We switched it on before awakening the patient. In the presence of DBS, PNS can be used safely for neuromuscular block assessment and for peripheral nerve blocks.[1,6] An alternative is ultrasound-guided nerve block, but this modality was not available to us. Interscalene block probably contributed to reduction of general anaesthetics as our patient required no vecurinium top-ups and minimal isoflurane. It also contributes to good surgical field with use of lesser amounts of irrigating fluids at a lower pressure, quick emergence from anaesthesia, and good postoperative analgesia. Continuous delivery of antiparkinsonian medications during perioperative period is desirable to avoid "off" symptoms and increased peri- and postoperative complications.[7] Alternative routes of administration for continuous drug delivery such as nasogastric or intraduodenal levodopa, iv amantadine, subcutaneous apomorphine, transdermal rotigotine patch may be resorted to in situations where patients are not going to be started orally in the immediate postoperative period.[1,7] Drugs with extrapyramidal side effects such as metoclopramide, phenothiazines, and butyrophenones should be avoided. Autonomic dysfunction in our patient with longstanding PD probably contributed to intraoperative rise of blood pressure in our patient.

In the view of the presence of DBS, preoperative shoulder injury evaluation of our patient was done by ultrasound rather than MRI that is the usual practice. Powerful electromagnetic fields of MRI can produce heating effects, movement of neurostimulator, induced stimulation, or DBS malfunction.[1,2] CT scans, fluoroscopy, and plain X-rays can be performed as usual. Defibrillator paddles and ground plate of unipolar diathermy should be placed as far from the neurostimulator as possible and perpendicular to it with use of lowest clinically appropriate energy output. Whenever possible, bipolar diathermy should be used. After use of diathermy and external defibrillator, adequate function of neurostimulator should be confirmed. In our patient, radiofrequency ablation (bipolar device) was used for surgical haemostasis. Switching off the battery of DBS avoids electromagnetic interference with monitoring and therapeutic devices. Multidisciplinary team involvement is important in planning and management of these patients. As the number of patients with DBS are increasing, they can present even for emergency surgery when there is limited time and resources available for assessing the DBS.[8]

CONCLUSION

Successful management of a patient of PD with DBS requires meticulous preoperative assessment, planning, continuation of antiparkinsonian drugs, avoidance of drugs precipitating parkinsonian symptoms, and adherence to precautions to avoid DBS malfunction. Combination of general anaesthesia with interscalene approach brachial plexus block provides ideal conditions for these patients undergoing shoulder arthroscopy.

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