NeuroSurgery in a Symptomatic Myasthenia Gravis Patient

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Abstract

Myasthenia gravis is an autoimmune disease characterized by weakness and fatigability of skeletal muscles, with improvement following rest. It may be localized to specific muscle groups or it may be generalized. The preoperative management of a patient with myasthenia gravis poses a significant challenge to the anesthesiologist. In this report, we present the case of a symptomatic myasthenia patient who underwent a neurosurgical procedure successfully.
An attempt to estimate neuromuscular blockade after the administration of non depolarizing relaxants to anaesthetized myasthenic patients is described.

INTRODUCTION

Myasthenia gravis (MG) is an autoimmune disorder with an estimated prevalence of 1 in 20,000. The disorder affects females more than males ([1], [2]). MG is caused by a decrease in the numbers of postsynaptic acetylcholine receptors at the neuromuscular junction ([3]), which decreases the capacity of the neuromuscular end-plate to transmit the nerve signal. Normally, in response to a stimulus resulting in depolarization, acetylcholine is released presynaptically and acts on the motor end plate to initiate a muscle action potential. In MG, the number of activated postsynaptic receptors may be insufficient to trigger an action potential ([4], [5]).

The hallmark of disease is weakness and rapid exhaustion of voluntary skeletal muscle with repetitive use followed by partial recovery with rest. Skeletal muscles innervated by cranial nerves are especially vulnerable. ([6])

Classification of MG (Osserman): grade I – only eyes affected, grade Ia – mild generalised MG responding well to therapy, grade Ib– moderate generalised MG responding less well, grade III – severe generalised disease, grade IV – myasthenia crisis requiring mechanical ventilation.([7])

CASE REPORT

A 63 year-old male weighing 60 kg with MG , was scheduled for neuro surgery. He presented with chief complaints of generalized weakness on exertion and ptosis since 3 years, vomiting headache and occasional complaints of giddiness since 1 month. On MRI he was diagnosed to have a SOL in right posterior parietal region measuring 27mm, 27 mm and 36 mm.

During preoperative evaluation, the patient was in good condition. His hemogram, coagulation profile, serum electrolytes, blood sugar and urine examination were normal. Serum creatinine was 1.41. ECG was showing LVH. Chest X-ray was within normal limit. PFT showed mild restrictive lung disease. He was on tab. Pyridostigmine bromide 60 mg TDS and tab. Prednisilone 15 mg OD.

ANAESTHETIC MANAGEMENT

As patient was posted for neurosurgery, general anesthesia was preferred. His routine medications were continued on the day of surgery. High risk consent and consent for post op ventilation was taken for myasthenia gravis and neurosurgery.

On the day of operation, following a fast of 8 hours, the patient was taken to operating room. 18 Gauge cannula was inserted and crystalloid infusion was started. Inj. Ranitidine 1mg/kg and Inj. Ondansetron 0.1 mg/kg was given intravenously. He was monitored with peripheral oxygen saturation, electrocardiogram, cutaneous temperature, noninvasive blood pressure and neuromuscular transmitter. Heart rate: 87/ min, SpO2: 98%, blood pressure: 130/70 mmHg, body temperature: 37.3 ºC and TOF: T4/T1 > 0.9.

Premedication was given with Inj. Glycopyrolate 0.2 mg, Inj. Midazolam 2mg, Inj. Fentanyl 100mcg and Inj. Hydrocortisone 100mg just before induction. Patient was preoxygenated with 100% oxygen and than induced with Inj.

Propofol 100mg, Inj. Atracurium 15mg and inhalational anesthetic agent-Isoflurane. Pt was intubated once there was loss of all four responses in TOF. Nasal intubation was done with 7.5 no. portex cuffed tube. Anesthesia maintained with 02, N20 and isoflurane. Patient was placed in lateral position and surgery was started. Patient's vitals were stable throughout the surgery, which lasted for 2 1/2 hours(Near total excision of tumor was done).

Neuro muscular monitoring was done throughout the surgery using Datex Ohmeda Aisys Carestation NMT Module. A train of four supra-maximal nerve stimuli was applied to the ulnar nerve and the twitch response in the adductor pollicis was recorded. The frequency of the train used was 2 Hz with an interval of 10 seconds between the trains. The ratio of the height of the fourth response of the train to that of the first (T4/T1) gave a good indication of the degree of residual neuromuscular block.

Bolus doses of atracurium were given to maintain only 2or 3 responses of TOF. At the completion of surgery, when all four responses to TOF reappeared and T4/T1 >0.7, patient was given Inj. Neostigmine 50mcg/kg and Inj. Glycopyrolate 10mcg/kg to reverse the neuromuscular blockade.

Once the patient regained consciousness and adequate spontaneous respiration, he was shifted to ICU with Nasal ETT in situ. Oxygen was given through T-piece and vital parameters were monitored for 12 hrs. Analgesia was provided with Inj. Tramadol 50mg 8hrly and Inj. Diclofenac 75mg 8hrly.

Subsequent dose of tab. Pyridostigmine was replaced with Inj. Neostigmine 2mg with Inj Glycopyrolate 0.2 mg IV 4 hrly. Tab. Prednisolone was replaced with Inj. Dexamethasone 8 mg 8hrly. The patient did not require ventilatory support anytime during the night.

On the next day, the patient was extubated after confirming head lift for > 5 sec and also fulfilling other criteria of extubation. The patient was started on oral drugs as per schedule for myasthenia gravis and was discharged on 5th post op day without any complication.

DISCUSSION

Anesthesia for myasthenia gravis obviously depends on the severity of MG and the procedure. Myasthenics must be considered as high risk patients. It is imperative to know the exact pathophysiology of the disease pattern with its three types of crisis including their treatment in order to perform safe anesthesia and to reduce the rate of perioperative complications.($_{8}$)

Similarly, anesthesia for neurosurgery requires an understanding of the pathophysiology of the presenting condition, the ability to manipulate intracranial physiology to provide optimal intraoperative conditions and the ability to respond to complications. NeuroSurgery presents a unique set of potential problems: obstructive hydrocephalus, possible injury to vital brain stem centers, unusual positioning, pneumocephalus, postural hypotension, and venous air embolism. ($_{9}$)A smooth induction and intubation followed by uniform IPPV with a muscle relaxant and titrated doses of narcotics and volatile agents for a balanced anesthesia are the requisites for a neuro surgical procedure.

In the preoperative phase for a myasthenic patient, we must consider a few specific angles besides the routine. Patient should be assessed for the predictors which hint at a possible need for post operative ventilatory support. They are-

- Duration of disease (> 6 yrs)
- Co-existing chronic respiratory disease
- Dose requirement of pyridostigmine (>750mg/day)
- Vital capacity (<2.9 L) (10)

These patients have a compromised respiratory reserve, hence depressant drugs and opiates are best avoided. Chest X ray and pulmonary function tests are also mandatory.

Treatment with cholinesterase inhibitors as practiced in myasthenics is continued unchanged or with only slightly reduced dosage up to the day of the operation. If necessary, oral administration may be changed to intramuscular or intravenous application.

Myasthenia gravis is an important disease to anesthesiologists, because it affects the neuromuscular junction. A balanced technique of general anesthesia which includes the use of muscle relaxants can be safely used, provided neuromuscular transmission is monitored.(1) Due to the individual variability in the response to muscle relaxants, accurate titration in combination with pre- and intraoperative neuromuscular monitoring is essential for myasthenic patients. Myasthenia gravis patients who show a train-of-four ratio (T4/T1) < 0.9 in the preanesthetic period will have increased sensitivity to nondepolarizing

neuromuscular blocking agents compared with myasthenia gravis patients with preanesthetic T4/T1 > or = 0.9(12). Myasthenic patients are sensitive to nondepolarizing relaxants but intermediate-acting nondepolarizing relaxants such as atracurium and vecuronium (one-half to one-tenth of normal dosage)(13) are eliminated rapidly & can be titrated to achieve required neuromuscular block that can be completely reversed at the end of surgery.

Succinylcholine is used only in case of rapid sequence intubations (half of the normal dose). Patients may be resistant to depolarization due to reduced receptor sensitivity. This in conjuction with treatment induced plasma cholinesterase deficiency, lead to increased risk of phase-II block.

In this case as patient was posted for neurosurgery, we avoided depolarizing muscle relaxant and selected atracurium for induction and maintenance. Pre induction T4/T1 was 0.9. So we gave 15 mg of atracurium for intubation.

Nasal intubation was preferred as we anticipated the potential need of post operative ventilation.

In myasthenic patients, giving reversal at the end of surgery is controversial. However, if preoperative symptom control has been good, standard dose of reversal should be given.

Clinicians are well aware of the risk of respiratory failure postoperative that may result from stress-induced exacerbation of myasthenia gravis (myasthenic crisis), an overdose of anticholinesterases (cholinergic crisis), the residual effects of myorelaxants or other adverse drug interactions (with antibiotics or antiarrhythmics). Therefore, routine postoperative ventilatory support and planned extubation in the intensive care unit have been recommended in high-risk patients. (14)

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