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Anaesthetic Management In Patient of Myasthenia Gravis Undergoing Thymectomy

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Abstract

Myasthenia Gravis (MG) is an autoimmune disease of neuromuscular junctions (NMJ). The pathophysiology involves the formation of auto-antibodies against postsynaptic nicotinic acetylcholine (ACh) receptors, thus decreasing their number and making them inadequate to trigger a muscle action potential. It is characterized by weakness and fatigability of skeletal muscles, which usually attenuate after period of rest.

We present a case of a 26 years old male patient, weighing 60 kg with chief complaints of difficulty in speech and swallowing, generalized weakness of limbs since 2-3 years. After establishing the diagnosis of MG, patient was posted for thymectomy. Patient was on Pyridostigmine 60mg, tab. Prednisolone 20mg and tab. Azathioprine 50mg as medical treatment for MG. On the day of surgery thoracic epidural was given using 18 gz epidural needle. Pre-oxygenation was done with 100% oxygen for 3 minutes. Induction was done with inj. Midazolam 2mg IV, inj. Fentanyl 80mcg, inj. Propofol 2 mg/kg IV along with 2% sevoflurane as inhalational anaesthetic agent with 100% oxygen. Under direct laryngoscopy, airway was secured with cuffed ETT of size 8mm ID. Propofol infusion was started @ of 10 $mg^{-1}h^{-1}$ for 30 minutes and gradually tapered to 5 $mg^{-1}h^{-1}$ thereafter for remaining surgery and top up through epidural catheter to maintain adequate analgesia. Rate of propofol infusion was tapered 20 min prior to surgery. Surgery concluded successfully without the use of muscle relaxant and aborting the need of neostigmine. Patient was extubated successfully and shifted to ICU for further observation.

Keywords: Myasthenia gravis; anaesthetic management; TIVA

Introduction

Myasthenia Gravis (MG) is an autoimmune disease of neuromuscular junctions (NMJ).[1] The pathophysiology

involves the formation of auto-antibodies against postsynaptic nicotinic acetylcholine (ACh) receptors, thus decreasing their number [2] and making them inadequate to trigger a muscle action potential.[3] It is characterized by weakness and fatigability of skeletal muscles, which usually attenuate after period of rest.[4] The disease can either be generalized or localized to specific skeletal muscle group. The disease commonly presents with involvement of eyelids (ptosis) and extraocular muscles (vision difficulty). Bulbar involvement may be suggested by difficulty in chewing, swallowing and speaking (dysarthria). The severe progression of disease can lead to generalized weakness and some may develop respiratory failure, requiring mechanical ventilation. The immune process in MG is closely related to thymus, containing B cells synthesizing anti-receptor antibodies. Therefore, thymoma is present in 10 –15% of patients with MG.[5]

The main considerations for an anesthesiologist in a patient with MG are its interactions and sensitivity towards various anesthetic drugs, like neuromuscular blocking agents (NMBAs) and volatile agents. Consequently, total intravenous anesthesia (TIVA) avoids the use of both NMBAs and volatile agents and has been recommended for these patients.[6, 7] We herein describe the case report of successful use of a propofol and fentanyl based TIVA technique, in combination with a high thoracic epidural, in a patient with MG posted for thymectomy.

Case Report

A 26 years old male patient, weighing 60 kg presented with chief complaints of difficulty in speech and swallowing, with generalized weakness of limbs since 2-3 years. Investigations like tensilon test, presence of acetylcholine receptor antibodies in blood and nerve conduction studies established the diagnosis of myasthenia gravis. The CT scan suggested the presence of thymoma, for which thymectomy was planned through a median sternotomy.

During pre-operative assessment, patient was taking tab. Pyridostigmine 60mg, tab. Prednisolone 20mg and tab. Azathioprine 50mg as medical treatment for MG. He had undergone plasmapheresis three times in which 10 units of fresh frozen plasma were transfused two days before surgery. His vitals were stable and all investigations were within normal limits. Patient was scheduled for surgery under general anaesthesia (GA). Patient was kept nil per mouth for 8 hours before surgery. Informed and written consent was taken for post operative ventilatory support requirement. Patient was pre-medicated with tablet ranitidine 150 mg and alprazolam a day and 2 hours before surgery. On the day of surgery, patient was shifted to operation theatre and all routine monitors were attached. Two IV lines were secured with16 G cannula. In sitting position, patient's back was cleaned and draped under all aseptic precautions. T6-T7 space was identified and 2ml of 2% lignocaine is infiltrated into skin and subcutaneous tissue. 18 G epidural needle was inserted using loss of resistance (LOR) technique, space identified, catheter inserted and properly secured. Test dose of 3ml of 2% lignocaine with adrenaline was given and vitals were recorded. Pre-oxygenation was done with 100% oxygen for 3 minutes. Induction was done with inj. Midazolam 2mg IV, inj. Fentanyl 80mcg, inj. Propofol (160+40) mg IV along with 2% sevoflurane as inhalational anaesthetic agent with 100% oxygen. Patient was ventilated for one minute. Under direct laryngoscopy, airway was secured with cuffed ETT of size 8mm ID. Anaesthesia was maintained with 60% N_2O + 40% O_2 + 2% sevoflurane. A tidal volume of 480 mL, respiratory rate of 12/min, I:E ratio of 1:2 were the ventilator settings. Propofol infusion was started @ of 10 $mg^{-1}h^{-1}$for 30 minutes and gradually tapered to 5 $mg^{-1}h^{-1}$thereafter for remaining surgery. Under

all aseptic precautions, left radial artery was catheterized with arterial cannula for IBP monitoring. Intraoperative analgesia was maintained with epidural top up of 10mL of 0.125% bupivacaine and injection ketorolac 30mg IV. The haemodynamic parameters were stable throughout the surgery. The surgery lasted for 4 hours with urine output of 1500 ml and blood loss upto 800 ml. Patient was successfully extubated. Injection paracetamol IV was given for post-operative pain relief. The patient was transferred to the ICU, spontaneously ventilating with 8 L/min of facemask oxygen and saturation between 97-99%. The facemask oxygen was reduced to 4 L/min. He was discharged from the ICU for high dependency care, where he was able to recommence his oral pyridostigmine at the preoperative dose. The supplemental oxygen was weaned off overnight and by early next morning he was maintaining saturation normally on air.

Discussion

Anaesthetic management in MG patients require special attention and individualized management in preparation for surgery,[8] with close monitoring along with proper selection of drugs.[8, 9] Surgery and anaesthesia in such patients are always high risk with complications scaling up to death [8]. These patients may also require prolonged ventilation in ICU settings.[10-12]

Patients with MG are resistant to neuromuscular blockade with depolarising NMBAs (succinylcholine) because they have decreased number of acetylcholine receptors.[2, 13] Commonly there are two approaches to administer GA in these patients-

i) with non-depolarising NMBAs (rocuronium, vecuronium, cis-atracurium)

ii) without non-depolarising NMBAs.

The use of fentanyl-propofol combination, fentanyl-sevoflurane combination, has been reported in literature.[14] In this case we administered GA using fentanyl-propofol combination (TIVA) without non-depolarising NMBAs. TIVA avoids the use of both NMBDs and volatile agents which provide excellent intubating conditions and good quality maintenance of anesthesia.[15-18]

Volatile agents have a inhibitory effect on neuromuscular transmission and can exaggerate the effects of any administered NMBDs.[19, 20] These neuromuscular deficits are not a feature of propofol that makes TIVA technique of choice in these patients. NMBDs have also been used, but their dosage needs to be carefully monitored with a nerve stimulator. Atracurium is recommended as the agent of choice, although vecuronium has also been used successfully, but in a much reduced dose.[20, 21]

Absolute muscle relaxation was not required for the surgery to be undertaken, so TIVA technique was used successfully. In thoracic surgery, post operative analgesia is effectively achieved with the help of epidural anaesthesia. The high thoracic epidural block provided for superior pain relief outweighed these risk of cardiovascular and respiratory instability. There were no episodes of any bradycardia hypotension in the post-operative period and respiratory function was also well maintained, with rapid weaning of oxygen.

Conclusion

We recommend the successful use of TIVA in combination with a thoracic epidural in patients undergoing thymectomy for MG. The patient did not require any additional respiratory support or prolonged monitoring in ICU setting. Hence this technique was well tolerated and allowed a rapid recovery from anaesthesia with minimal postoperative morbidity.

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- **Authorship Statement**

The manuscript has been read and approved by all the authors, that the requirements for authorship as stated earlier in this document have been met, and that each author believes that the manuscript represents honest work.