

Anaesthetic Management of Myasthenia Gravis in Coronary Artery Bypass Grafting

Abstract

Myasthenia gravis (MG) is an autoimmune disease affecting the neuromuscular junction causing weakness and fatigability of muscles. Careful perioperative management is required because of the unpredictable susceptibility to muscle relaxants. In this case report, we describe the successful management of a MG patient for normothermic coronary artery bypass graft (CABG) surgery with titrated doses of rocuronium without prolonged postoperative ventilation. We chose rocuronium because full and rapid recovery of neuromuscular blockade is possible with sugammadex. We conclude that using rocuronium is safe during general anaesthesia in MG patients undergoing on-pump CABG when combined with continuous neuromuscular monitoring and careful perioperative management.

Keywords: Coronary artery bypass graft, myasthenia gravis, rocuronium

Introduction

Myasthenia gravis (MG) is an autoimmune neuromuscular disorder resulting in weakness and fatigability of skeletal muscles; usually due to autoantibodies directed against acetylcholine receptors (AChRs) at neuromuscular junctions (NMJs). Therefore, careful perioperative management is required because of the unpredictable susceptibility to muscle relaxants.

There are not many reports describing the management of myasthenic patients undergoing cardiac surgery. In this report, we describe the successful anaesthetic management of a patient with MG undergoing coronary artery bypass grafting (CABG).

Case Report

A 75-year-old man with MG was diagnosed with myocardial infarction (MI) after he presented with severe angina. Coronary angiogram revealed a severe triple vessel disease and was scheduled for CABG. The patient was diagnosed with seropositive ocular onset MG 4 years before admission for which he was prescribed pyridostigmine 60 mg per day and prednisolone 5 mg per day. Clinically the patient did not have any

weakness of ocular or skeletal muscles. He had no complaints of ptosis or dysphagia. On the day preceding surgery, muscle strength and bulbar system were found normal. Respiratory function tests revealed forced vital capacity (FVC) of 3.53 l (78% of predicted) and forced expiratory volume in 1 s (FEV1) of 3.10 l (92% of predicted). FEV1/FVC ratio was 88%. Arterial blood gases (ABG) were within normal ranges. His preoperative blood chemistry demonstrated an elevated anti-AChR antibody concentration of 16 nmol/l (0–0.44 nmol/l in normal patients). His other past medical history included hypothyroidism, hiatus hernia, smoking and other bloods were unremarkable. The patient's height was 184 cm and his weight was 84.3 kg.

The patient received his routine anti-myasthenia medications on the morning of surgery. He was premedicated with 10 mg temazepam the night prior and 20 mg temazepam and 30 mg lansoprazole 1 h prior to surgery.

In the operating room, standard intraoperative monitoring and Bispectral Index Monitoring (BIS) was applied and intravenous and radial artery catheters were inserted. General anaesthesia was induced with fentanyl (10 mcg/kg, IV) and midazolam (0.05 mg/kg, IV). Rocuronium

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12.5 mg was administered while a neuromuscular transmission monitor was applied to the patient and Train of Four (TOF) count was recorded every minute to be still 4/4 after 3 min. A further 12.5 mg rocuronium was administered but the TOF count was still 4/4 after 6 min.

Bag-mask-ventilation was easy without any problems. However, at this time point it was decided to intubate the patient without further administration of rocuronium but with good intubating conditions and vocal cords fully relaxed at laryngoscopy. Anaesthesia was maintained with target controlled infusion (TCI) propofol and TCI remifentanyl. Lungs were ventilated with an air-oxygen mixture, and normocapnia was maintained. Following intubation a quad-lumen central venous catheter and a transoesophageal echocardiography probe were placed. A further 50 mg rocuronium was given before incision as the patient started breathing. Following this dose the TOF count was 0/4 prior to incision. Cardiopulmonary-bypass (CPB) technique with maintenance of normothermia was applied. Weaning from CPB was carried out uneventfully at a temperature of 36° with minimal vasopressor support. There were no diaphragmatic or other muscle movements during the procedure.

The patient was transferred to the intensive care unit (ICU) with continuous intravenous infusion of propofol with morphine infusion added on the unit to provide sedation and analgesia. No muscle relaxant was used postoperatively. The patient was haemodynamically stable, TOF count was 2/4 and temperature was 34°C. This drop in body temperature was may be due to transport or the initial phase in the ICU. The patient was warmed up to 36°, weaned from the ventilator and extubated awake and alert uneventfully after about 5 h from admission to the ICU. No sugammadex was used. The patient received his normal MG therapy the next morning. Blood gas tensions were within normal values before and after extubation. The patient was discharged to the general ward on the third postoperative day. Arterial blood samples for evaluation of serum anti-AChR antibody concentrations were taken before surgery, on admission to ICU and before discharge. The anti-AChR antibody concentration was 16 nmol/l before surgery; 14.40 nmol/l on admission to ICU and 14.10 nmol/l before discharge.

Discussion

Our case report shows the successful management of a MG patient for normothermic cardiac surgery with titrated doses of rocuronium without prolonged postoperative artificial lung ventilation.

There have been many approaches to manage MG patients during major surgery. Some use general anaesthesia without muscle relaxants with inhaled agents for inducing neuromuscular blockade.^[1,2] However, deep inhaled

anaesthesia can have haemodynamic side effects. Total intravenous anaesthesia with propofol has also been used in cardiac anaesthesia;^[3,4] however, it can also cause haemodynamic disturbances. A balanced technique using muscle relaxants has been used before Baraka *et al.*, 2000 (cisatracurium);^[5] Itoh *et al.*, 2002 (vecuronium);^[6] Mann *et al.*, 2000 (atracurium).^[7]

Combination of rocuronium and sugammadex has been widely used both in myasthenic as well as non-myasthenic patients in non-cardiac surgery.^[8,9] Its use in cardiac surgery in myasthenic patients has not been reported. We chose rocuronium because full and rapid recovery of neuromuscular blockade is possible with sugammadex in MG patients.^[10]

Hypothermia during CPB reduces muscle strength in the presence of muscle relaxants or otherwise. Our patients underwent CABG with normothermic CPB to avoid muscle weakness due to CPB.

Although this patient's anti-ACh receptor antibody was high, he was asymptomatic and his myasthenia was clinically well controlled. Hence, we did not give intravenous immunoglobulin (IVIG) to this patient preoperatively. Even though there is some evidence of efficacy of IVIG in myasthenic crisis, there is insufficient evidence to suggest its benefit in chronic MG. In our patient the anti-AChR antibody concentration declined slightly at the end of procedure and consecutively remained at a lower level prior to discharge. The decrease in anti-AChR antibody concentration may have been caused by CPB institution, haemodilution and adsorption of antibodies to the CPB circuit components.

The most common postoperative complication among patients with MG is respiratory failure. Continuous neuromuscular monitoring would detect any residual muscle paralysis from rocuronium which could be rapidly and fully reversed with sugammadex. However, one should keep in mind that cisatracurium based on the Hofmann elimination may be a good alternative. In our unit all patients post-CABG are transferred to ICU for sedation and ventilation. Though, most of the patients in our unit are extubated in around 6–8 h, in case of any muscle weakness or ventilator insufficiencies due to myasthenia they could be ventilated for longer. Hence careful monitoring is required especially meticulous nursing care, monitoring of ventilator parameters and regular blood gases. It is important that the patients do not miss their MG medications. If not extubated, they will need a nasogastric tube for their administration. Patient on higher doses of steroids may need extra perioperative steroid doses. Our patient was taking a small dose of steroid insufficient to cause adrenal axis suppression and hence did not need perioperative steroid supplementation.

Our patient required near normal doses of muscle relaxant and recovered from the muscle relaxant in a normal time frame. This was because of good control of his MG. He was compliant and regular with his medications and had no symptoms, which assured us of good disease control. He received his medications on the day of the surgery which helped in the perioperative management. It reiterates that good preoperative control of MG is more important than choice of muscle relaxants. A well-controlled MG patient behaves essentially like a normal patient.

Summary

In conclusion, we found that titrated doses of rocuronium are safe during general anaesthesia in MG patients undergoing cardiac surgery for on-pump CABG when combined with continuous neuromuscular monitoring and careful perioperative management.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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