

Fabio Silvio Mario Araimo Morselli*,
Paolo Tordiglione, Ilaria Scarpa,
Francesco Zuccarini and Giovanni Rosa

Department of Anaesthesiology and Critical Care
Medicine, Sapienza University of Rome, Italy

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*Corresponding author: Fabio Silvio Mario Araimo
Morselli, Department of Anaesthesiology and Critical
Care Medicine, Sapienza University of Rome, Italy,
E-mail: f.araimo@policlinicoumberto1.it

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Case Report

Severe Repeated Hypotension Occurred after Rocuronium Administrations in a Morbidly Obese Patient: A Case Report

Abstract

Rocuronium pharmacokinetics and pharmacodynamics can be influenced by several factors like gender and obesity. We propose a brief report of a patient (59 years old, weight 135 kg, BMI 52.7) who showed three episodes of severe hypotension not responsive to continuous noradrenaline infusion therapy after rocuronium administration (dose 0.6 mg/kg; total dose: 50 mg) not based on her IBW (ideal body weight).

Introduction

Rocuronium has the most rapid onset of action among the non-depolarizing neuromuscular blocking drugs; doses of 0.6-0.9 mg/Kg guarantee a complete block in about 60-90 seconds and good or excellent intubating conditions in 60 seconds [1,2].

Its pharmacokinetics and pharmacodynamics can be influenced by different factors as age, inhaled anesthetics, hepatic and renal insufficiency, hypothermia, gender and obesity [3-8].

Rocuronium has been shown to cause less histamine release and cardiovascular instability than benzyloisoquinolinium neuromuscular blocking agents such as atracurium and mivacurium [9], however it can act as an antigen: in our clinical experience three acute reactions occurred after its administration in the same patient.

Case Report

03/05/2014

08:11 p.m.

A 59 years old female unconscious (GCS 3), weight 135 Kg (BMI 52.7), intubated (oro-tracheal tube Ø 7), in spontaneous ventilation manually assisted, in treatment for hypertension, arrived at the Emergency Department, Subiaco Hospital.

Mechanical ventilation in IPPV (Intermittent Positive-Pressure Ventilation), FiO₂ 100%, was immediately set along with continuous infusion of propofol 2% (2-4 mg/kg/hr; 10-20 ml/hr). Relative bradycardia was corrected by two atropine boluses i.v. (0.5 + 0.5 mg).

An episode of hypotension was treated by stopping propofol infusion and starting Emagel 1000 ml (polygeline 38 g/L) and noradrenaline (0.05-1 µg/kg/min; 10 ml/hr) infusion.

One hour and a half later, blood pressure was 140/110 mmHg.

04/05/2014

0:38 a.m.

The patient sedated, intubated, under manual assisted ventilation and neurologically not evaluable was moved to our Emergency Department.

The therapy was confirmed by neurosurgical consultation: the patient underwent mannitol 18% solution (100 ml x 4/day i.v.), nimodipine (15-30 µg/kg/hr; 10 ml/hr), pantoprazole (40 mg i.v.).

1:17 a.m.

The patient was easily arousable, CGS 14 and underwent to propofol 2% (2-4 mg/kg/hr; 10-20 ml/hr), remifentanil (0.75-1 µg/kg/min; 6 ml/h).

1:45 a.m.

The patient underwent CT cerebral angiography. It showed right hemisphere subdural hematoma and posterior cerebral artery aneurysm (diameter: 7 x 4 mm).

2:02 a.m.

The patient was moved back to the Emergency Department. An episode of persistent hypotension occurred and was treated by stopping propofol, remifentanil and nimodipine infusion along with Emagel 500 ml (polygeline 38 g/L) and noradrenaline (0.05-1 µg/kg/min; 3-10 ml/hr) infusion. After few minutes, MABP (Mean Arterial Blood Pressure) was about 60-80 mmHg.

02:56 a.m.

Blood pressure was slowly improving.

05/05/2014

10:00 a.m.:

The patient was hemodynamically stable; after neurosurgical

consultation dose of mannitol 18% was increased to 100 ml x 6/day and a second CT cerebral angiography was performed.

3 - 3:45 p.m.:

Surgical operation for single burr hole drainage of the cerebral hematoma: the patient arrived in neurosurgery intubated, in manually assisted ventilation, with continuous infusion therapy of propofol 2% (2-4 mg/kg/hr; 10-20 ml/hr), remifentanyl (0.75-1 µg/kg/min; 6 ml/h) and nimodipine (15-30 µg/kg/hr; 10 ml/h). Mechanical ventilation CMV (Controlled Mechanical Ventilation) was immediately set up; continuous infusion of propofol 2% and remifentanyl was maintained and modulated for sedation.

When patient-ventilator dyssynchrony occurred neuromuscular blocking was induced with rocuronium (dose 0.6 mg/kg; total dose: 50 mg); suddenly the first episode of persistent hypotension linked to rocuronium administration occurred and was treated by stopping propofol, remifentanyl and nimodipine infusion and starting Emagel 500 ml (polygeline 38 g/L) and noradrenaline (0.05-1 µg/kg/min; 3-10 ml/hr) infusion.

After few minutes, MABP was about 60-80 mmHg; noradrenaline's infusion was slowed down as blood pressure rose. It took about two hours before blood pressure reached values of 120/60 mmHg.

During surgery 1000 ml of saline solution 0.9% were infused; fluid balance over 24 hours was about - 500 ml.

7.00 p.m.

Patient-ventilator dyssynchrony and low SpO₂ occurred again, they were treated with rocuronium administration (dose 0.6 mg/kg; total dose: 50 mg). A second episode of persistent hypotension linked to rocuronium administration occurred and was treated by stopping propofol, remifentanyl and nimodipine infusion and starting infusion of 500 ml of Emagel solution (polygeline 38 g/L) and noradrenaline (dose: 0.05-1 µg/kg/min; infusion rate: 3-10 ml/hr). After few minutes, MABP was about 60-80 mmHg; noradrenaline's infusion was slowed down as blood pressure rose; it took about two hours before blood pressure reached values of 120/60 mmHg.

As the patient became emodinamically stable, she was moved to Post-Neurosurgery Intensive Care Unit.

07/05/2014

10.30- 2.00 p.m.

The patient underwent to a second surgical operation for aneurysm sac embolization. She was moved in neurosurgery intubated, in manually assisted ventilation. Anesthesia was induced with propofol (15 mg i.v.), fentanyl (200 µg i.v.) and cisatracurium (dose: 0.15 mg/kg; total dose: 12 mg i.v.). CMV was immediately set up; anesthesia was maintained with fentanyl (50 x 2 µg i.v) and cisatracurium (4 mg x 3 i.v.).

During surgery 1000 ml of saline solution 0.9% were infused.

Blood pressure and complete blood count remained normal for the entire surgery; neuromuscular blocking was performed with cisatracurium, there were no episodes of hypotension.

The patient was finally moved to Post-Neurosurgery Intensive Care Unit.

08/05/2014

3.00 a.m

During the night, patient-ventilator dyssynchrony and low SpO₂ occurred and were treated with rocuronium administration (dose 0.6 mg/kg; total dose: 50 mg); the third episode of persistent hypotension linked to rocuronium administration was treated by stopping propofol and remifentanyl infusion and starting infusion of 500 ml of Emagel solution (polygeline 38 g/L) and noradrenaline (dose: 0.05-1 µg/kg/min; infusion rate: 3-10 ml/hr). After few minutes, MABP was about 60-80 mmHg; noradrenaline's infusion was slowed down as blood pressure rose; it took about two hours before blood pressure reached values of 120/60 mmHg.

In the next hours the patient was treated with continuous infusion therapy of propofol 2% (2-4 mg/kg/hr; 10-20 ml/hr), remifentanyl (0.75-1 µg/kg/min; 6 ml/h), noradrenaline (0.05-1 µg/kg/min; 1 ml/h), nimodipine (15-30 µg/kg/hr; 10 ml/h) and amiodarone (10-20 mg/kg/min; 4ml/hr).

09/05/2014

Propofol 2% infusion was stopped and midazolam infusion was started (dose 0.03 mg/kg/hr; infusion rate: 12 ml/hr). Noradrenaline was slowed down throughout the day as blood pressure rose. Mannitol 18% solution (100 ml x 4/ day) was administered for two weeks.

Rocuronium wasn't administered anymore; in the next days the patient has been under treatment for hypertension with continuous infusion of nimodipine (dose: 15-30 µg/kg/hr; infusion rate: 10 ml/h) and metoprolol tartrate (dose: 10-20; infusion rate: 4 ml/h).

Discussion

We report our clinical experience because we noted a link between the multiple episodes of severe hypotension and rocuronium administration that was also justified by the fact that there wasn't hypotension when cisatracurium was administrated instead of rocuronium.

As showed by Xue et al. [7], women are 30% more sensitive to rocuronium than men. Maybe the different percentage of muscles and fats, the distribution volume, and plasma proteins concentration are linked to the different sensitivity. Because of the lower concentrations of plasma proteins women show an increase in the unbound fraction of rocuronium: that cause a greater drug concentration available for the tissue and receptor sites.

We know that obesity has a fundamental role on drug pharmacokinetics and pharmacodynamics; in a study by Puhlinger et al. [8], obese patients receiving rocuronium had shorter onset time and slightly longer duration of action compared to normal weight patients. Leykin et al. [10] found that in morbidly obese patients, the duration of action of rocuronium is significantly prolonged when it was dosed according to real body weight (RBW).

Moreover, in obese patients underwent to rocuronium administration according to Ideal Body Weight (IBW), the action

time was shorter and this was achieved without a significantly prolonged onset time or compromised conditions for tracheal intubation or surgery; the observed onset time around 80 s was clinically acceptable, and reversible of the neuromuscular blockade was possible after a median of 32 min in the IBW group [11].

Literature is still controversial about the effects of rocuronium on histamine release; rocuronium is intermediated in its propensity to cause allergy [9] but several clinical experiences report histaminoid reactions associated to its use [12,13].

We assume that our clinical experience may have two main causes: overdosing/inaccurate dosage of rocuronium, probably occurred because of the emergency situation of persistent patient-ventilator dyssynchrony, and histamine release.

Therefore, we agree with scientific community: pharmacokinetics and pharmacodynamics of rocuronium is strictly correlated to BMI and gender; regardless of its intermediate risk to induce histamine release, dosage should be assessed on the basis of IBW, even in emergency situations.

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