

RECOVERY RACE AGAINST ROCURONIUM: A CASE REPORT**¹Dr. Shibu Sasidharan, ²Dr. Shishir Kumar and ³Dr. Sarvesh Srivastava**¹Assistant Professor, MD, DNB, MNAMS; HOD (Anaesthesia); Dept of Anaesthesia and Critical care, Level 3 Hospital, Goma.²Reader, Dept of Anaesthesiology & Critical Care, 166 Military Hospital, Satwari Cantt, Jammu, Jammu and Kashmir.³Reader, Dept of Anaesthesiology & Critical Care, Level 3 Hospital, Goma.***Corresponding Author: Dr. Shibu Sasidharan**

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ABSTRACT

We describe a case of delayed recovery from neuromuscular blockade by Inj. Rocuronium in a patient undergoing laparoscopic surgery. **INTRODUCTION:** Laparoscopic procedures have replaced a variety of open intra-abdominal surgeries, because it is a relatively non-invasive procedure with fast recovery and less pain.^[1] Neuromuscular block is necessary for optimizing surgical field during pneumoperitoneum^[6] and preventing abdominal compartment syndrome.^[7] However, laparoscopy requires a formation of the working area within the peritoneal cavity, and this is commonly achieved by carbon dioxide (CO₂) pneumoperitoneum (PP), which raises concerns regarding the physiologic adverse effects.^[2,3] An increased intra-abdominal pressure by CO₂ inflation may cause significant changes in the hepatic function and blood flow.^[4,5] Rocuronium bromide is a widely used non-depolarizing neuromuscular blocking agent, because of its rapid onset and intermediate duration of action. Although its elimination pathway remains unclear, some hepatic elimination of compound in humans might be expected. In patients with decreased hepatic function, rocuronium pharmacodynamic and pharmacokinetic alterations have been reported.^[10-12] In addition, Wang et al.^[13] reported that the effect of rocuronium was prolonged in patients with obstructive jaundice and cautioned that monitoring the post-operative residual neuromuscular blockade should be needed in these patients.

KEYWORDS: decreased hepatic function, rocuronium pharmacodynamic and pharmacokinetic alterations.**CASE REPORT**

A 35 year old male patient presented with complaints of abdominal pain, weakness, diarrhea and loss of weight for the past two months. His investigations revealed macrocytic anemia and pancytopenia. His other abnormal reports were as follows. Hb: 6.8mg/dl, S Bil: 1.3, AST/ALT: 98/140, Albumin: 2.2. All other reports were within normal limits, including thyroid function tests. He was treated with 6 units PRBC and 4 units FFP blood transfusion for the anaemia and tablets - vitamin B12 and folic acid. No further investigations were done to rule out any specific liver pathology as the next reports of LFT came normal. He improved symptomatically and clinically too. In the course of evaluation he was found to have calculus cholecystitis and was planned for cholecystectomy.

The patient was premedicated with 1mg Inj midazolam and 80mcg of Inj fentanyl. He was induced with inj propofol 100mg. An intubating dose of 50mg rocuronium (0.9mg/kg) was used and patient was intubated with 8.5 size PVC endotracheal tube after 3 minutes. The depth of anaesthesia was maintained using nitrous oxide, oxygen and isoflurane at a MAC 0.9-1.1.

A laproscopic cholecystectomy was done which lasted for 2 hours and 30 minutes. Maintenance of neuromuscular blockade was started with 5mg of rocuronium, but since the effect waned off fast, 10 mg of rocuronium was given each time patient had spontaneous breathing every 40 minutes. However, at the end of surgery, the patient did not get any spontaneous effort even after 2 hours of the last 10 mg dose of rocuronium. Since 40 mins post the last dose, the patient started developing tachycardia and increased blood pressure ranging from 180-200mm Hg systolic and 85-110mm Hg diastolic. Inj Esmolol was used to control hypertensive episode. A train-of-four (TOF) response was used to assess recovery from neuromuscular blockade. TOF validated the complete blockade. After 2.5 hours of waiting in vain for any signs of reversal, the patient was shifted to ICU for further management. In the ICU, (after 3 hours of the last dose of muscle relaxant) the patient had spontaneous efforts of breathing, after which reversal of 2.5mg of neostigmine with 0.4mg Glycopyrolate was given. Patient's recovery was complete and uneventful after the reversal was given.

DISCUSSION

One of the factor that could prolong the neuromuscular blockage is liver dysfunction since rocuronium in healthy adults is mainly eliminated through biliary excretion.^[14] Our patient, however, had mild liver function abnormalities prior to blockage. Although his liver function showed normalisation of laboratory values on repeat, a reporting/technical error cannot be ruled out. No further evaluation of the liver status was done in view of patient's lack of symptoms. So, the possibility of a liver dysfunction cannot be overlooked. Prolonged block after the use of certain antibiotics were reported in the past.^[17] However, none of those said antibiotics or other concomitant and known interacting medication (anticonvulsants, calcium blockers) were used in this patient. This patient was normothermic and remained normothermic, both before and after resuscitation. (The use of therapeutic hypothermia can lead to further block prolongation. So, if one decides to use therapeutic hypothermia it would be prudent to monitor neuromuscular block if NMB are used.) Laparoscopy requires a formation of the working area within the peritoneal cavity, and this is commonly achieved by carbon dioxide (CO₂) pneumoperitoneum (PP), which raises concerns regarding the physiologic adverse effects.^[2,3] An increased intra-abdominal pressure by CO₂ inflation may cause significant changes in the hepatic function and blood flow.^[4,5] This could further amplify the existing liver pathology, as would have been in our patient. A previous animal study reported that changes in the intra-peritoneal pressure and position significantly influence the hepatic blood flow.^[21] They demonstrated that both, the portal and hepatic arterial blood flow were reduced in relation to an increased intra-abdominal pressure and head-up position rather than the systemic hemodynamic parameters.^[21] But this reduction of blood flow often occurred when the intraabdominal pressure is more than 20 mmHg. We tried to limit the intra-abdominal pressure at a level of 13-14 mmHg, and considering the fact that there was no deliberation done related to the altered liver function, it is difficult to rule out that the delay was caused by the irreversible decrease in liver function.

Isoflurane, like sevoflurane significantly potentiate the effect of neuromuscular blocking agent and its monitoring.^[24] We could not completely exclude the influence of inhalation agent even though we fixed the end-tidal concentration of isoflurane.

We cannot eliminate the possibility of other mechanical factors except the pure pneumoperitoneum effects. Jeong *et al.*^[27] reported that hepatic manipulation during surgical procedure is the main cause of changes in the hepatic function rather than CO₂ pneumoperitoneum.

CONCLUSION

Extreme prolongation of neuromuscular block after a few doses of rocuronium may be discovered more often in patients with deranged hepatic function. Studies show

that pneumoperitoneum and liver manipulations might result in delayed recovery from intense neuromuscular blockade by rocuronium by causing a transient decrease in the hepatic and renal functions induced by pressure effect of pneumoperitoneum. Isoflurane also potentiated the action of the blockade. It is good practice to check for residual block in each patient who has received a neuromuscular blocker especially in the presence of risk factors for block prolongation.

Competing interests

The authors declare that they have no competing interests.

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