

Review Article

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Are There Rocuronium Rapid Metabolizers? A Case Report on the Importance of Neuromuscular Monitoring



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Abstract

A healthy 34-year-old female was scheduled for laparoscopic hysterectomy and adnectomy under general anesthesia, combined with an epidural catheter. Throughout surgery, she required and received unusual high doses of rocuronium in unusual short intervals (1mg/kg/h) to maintain adequate neuromuscular block as confirmed by continuous neuromuscular monitoring. Also, despite a functioning epidural catheter, the patient required high doses of remifentanyl. This case emphasizes the importance of neuromuscular monitoring in every patient receiving neuromuscular blocking agents. It also raises the question if there are unknown influences or different mechanisms of metabolism.

Keywords: Rocuronium, Neuromuscular Monitoring, Metabolism

Abbreviations: BIS: Bispectral monitoring, nAChR: nicotinic Acetylcholine Receptor, NMBA: Neuromuscular Blocking Agent, PAP: Papanicolaou, TOF: Train of Four

Introduction

Neuromuscular blocking agents are commonly used in general anesthesia and are part of every anesthetist's routine. Neuromuscular paralysis is required for tracheal intubation as well as intraoperative, depending on the surgery performed. Although guidelines recommend the use of quantitative neuromuscular monitoring in all patients receiving a neuromuscular blocking agent (NMBA) [1], in everyday practice this recommendation is not always observed, especially in young and seemingly healthy patients. This is a report about a young and healthy female requiring unusually high doses of rocuronium to obtain an adequate neuromuscular block. Written patient consent was obtained.

Case Report

A 34-year-old female patient was scheduled for laparoscopic hysterectomy with bilateral adnectomy and pelvic lymph node dissection due to a pathologic Papanicolaou (PAP) test. The patient was unremarkable in weight and height (160cm, 56kg, BMI 21,9kg/m²), did not smoke or take recreational drugs and had no relevant allergies apart from allergic rhinitis. She had no

past medical history and no regular medication. Previous general anesthesia for cervical conisation was uneventful other than postoperative nausea and vomiting. The preoperative laboratory results were all within physiological range.

Before induction of anesthesia the patient received a peripheral vein catheter and a lower thoracic epidural catheter (Th12/L1) for intraoperative reduction of opioids and postoperative pain management. Subsequently, the patient was preoxygenated and anesthesia was induced using remifentanyl (1µg/kg over 60 seconds) and propofol (150mg, 2,6mg/kg). After bag-mask-ventilation was established, 30mg rocuronium were injected, and 5 minutes later, the patient was intubated without complications.

General anesthesia was maintained as total intravenous anesthesia using remifentanyl and propofol under bispectral monitoring guidance (BIS, Medtronic). Just before skin incision 10µg sufentanyl was administered via the epidural catheter, and continuous ropivacaine 0,2% was added later within the surgery.

Before skin incision a quantitative neuromuscular monitoring was established and train of four (TOF) ratio was 99% (35

minutes after initial dose of rocuronium). During surgery the patient received a total of 150mg rocuronium, which was about 1mg/kg/h (Table 1). Before extubation the TOF ratio was normal, no reversing drug was needed.

Table 1: Neuromuscular monitoring and rocuronium doses

Time	TOF (count / ratio)	Rocuronium (mg)
09:00	99%	
09:12		20
09:25	1	10
09:40	2	
09:42		10
09:51	1	
10:05	67%	
10:06		20
10:21	2	
10:44	96%	
10:55	100%	
11:15	100%	
11:18		30
11:21	1	
11:26	0	
11:36	1	
11:41	2	
11:46	41%	30
11:51	0	
missing data		
12:22		30
12:36	0	
12:45	1	
12:51	2	
12:56	25%	
13:01	52%	
13:06	77%	
13:11	82%	
13:16	87%	
13:21	91%	
13:26	97%	
13:28	98%	

TOF: Train of four.

In addition to the high rocuronium dosage, the patient required and received high doses of remifentanyl as well. Remifentanyl doses ranged between 0,2 and 0,26µg/kg/min despite epidural administration of sufentanil and ropivacaine.

Otherwise, general anesthesia could be carried out uneventful; there was no need for catecholamines and blood loss was unremarkable. After addition of 1g metamizole to the

infusion, the patient woke up without pain and showed no signs of postoperative nausea and vomiting.

Discussion

We present a case of a young and healthy female with a seemingly high metabolism of rocuronium.

Rocuronium is an aminosteroid NMBA, acting as competitive antagonist to the nicotinic acetylcholine receptor (nAChR), with hepatic metabolism. Elimination is predominantly hepatobiliary, with approximately 15% unmetabolized renal elimination [2]. Usual doses are around 0,6mg/kg for a regular, not rapid sequence induction, and a third of the initial dose for repetition. Clinical duration (duration 25%) is 45 minutes with a recovery index of around 10 minutes [3].

In our patient the clinical duration time was shortened to around 30 minutes with repetition doses of 0,5mg/kg and therefore more than double of the recommended dosage. This is both an unusually high repetition dose and a short recovery time. There are reports of reduced recovery time in patients with hyperparathyroidism, anticonvulsant drug treatment or long lasting steroid therapy [4-6], whereas a prolonged recovery time may be expected in patients suffering from liver cirrhosis or renal failure [2,3]. None of these conditions apply to our patient. There is a case report of a similarly healthy and young patient who also underwent surgery for hysterectomy and also recovered rapidly from rocuronium [7]. In this particular case the patient carried out extensive physical training and took self-prescribed nutritional supplements, which was the only unusual feature about the reported patient.

To our knowledge, this is the first report about a healthy patient with regular onset but rapidly shortened recovery time. This case undermines the importance of neuromuscular monitoring in all patients receiving neuromuscular blocking agents. On the one hand full recovery from neuromuscular blockade must be confirmed before ending anesthesia, thus avoiding respiratory complications postoperatively. On the other hand, adequate intraoperative neuromuscular blockade, and necessary repetition doses of NMBA may improve surgical conditions.

Additionally, it raises the question, if there are unknown influences on metabolism or different mechanisms of metabolism. It is noteworthy that this patient also required a relatively high dose of remifentanyl throughout surgery despite an effective epidural catheter, possibly indicating unusually rapid hepatic metabolism.

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