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Case Report

Anesthetic Management of a Patient with Muscular Disease Using Remifentanil Plus Propofol without Neuromuscular Blockade

Shinji Kurata[1], Yu Ozaki-Honda[1], Mizuki Yoshida[1], Takuro Sanuki[2], Ichiro Okayasu[2], Gaku Mishima[1], Takao Ayuse[1,2*]

[1]Nagasaki University Hospital, Department of Dental Anesthesiology, Japan

[2]Nagasaki University Graduate School of Biomedical Sciences, Department of Translational Medical Sciences, Japan

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Corresponding author:
T Ayuse,
Nagasaki University Graduate School of Biomedical Science, Department of Translational Medical Sciences, Division of Clinical Physiology, 1-7-1 Sakamoto Nagasaki, 852-8588, Japan, Phone: +81-95-849-7714; Fax: +81-95-849-7715;
Email: ayuse@net.nagasaki-u.ac.jp

ABSTRACT

We have experienced three cases of an anesthetic management of a patient with muscular disease without neuromuscular blockade during induction of general anesthesia, including a 72-year-old woman with a 14-year history of multiple system atrophy who underwent arthroplasty of the temporomandibular joint, a 12-year-old woman with spinal muscular atrophy who underwent dental treatment, and a 20-year-old man with Charcot-Marie-Tooth disease who underwent resection of amelobrastoma. All three patients received general anesthesia without muscle relaxants and their tracheas were intubated. In all cases, general anesthesia was induced with continuous infusion of remifentanil 0.25 ~ 0.3 γ (0.25~0.3μg/kg/min) and followed bolus injection of propofol (1mg/kg) and nasal intubation was performed without muscle relaxants. After tracheal intubation, anesthesia was maintained with either method of inhaled sevoflurane or propofol infusion. The tracheal tube was removed after confirming clear breathing sounds without any stridor. There was no respiratory complication such as desaturation due to an upper airway obstruction. An anesthetic management of a patient with muscular disease using remifentanil without neuromuscular blockade during induction of general anesthesia can be alternative method for the patients with neuromuscular disease and neuromuscular junction disease.

INTRODUCTION

The use of neuromuscular blocking agent during induction of anesthesia is useful method for smooth endotracheal intubation avoiding any spastic reflex of vocal cord. However, muscle relaxation is not recommended in patients with neuromuscular disease and neuromuscular junction disease, such as multiple system atrophy, muscular dystrophy. Although neuromuscular antagonist has become effective drug to reverse postoperative residual effect of neuromuscular blockade in these patients [1,2], the side effect of anaphylaxis has been recognized critical issue [3]. Recently, the anesthetic management using remifentanil plus propofol without neuromuscular blocking agent for induction has been clinically investigated [4-7]. A number of studies have indicated that the combination of remifentanil and propofol for performing intubation without neuromuscular blockade might be an appropriate method to maintain hemodynamic parameters during induction of anesthesia [8-10], compared to the sevoflurane as a sole induction agent [5,11]. In order to avoid influence of

bolus injection of remifentanil and propofol, we have applied continuous infusion technique with remifentanil plus propofol anesthesia for intubation during induction without neuromuscular blocking agents in patients with neuromuscular disease and neuromuscular junction disease, such as multiple system atrophy, muscular dystrophy in school children, young and aged patients. The aim of this study is to discuss the efficacy of continuous infusion technique in three different age categories with remifentanil plus propofol anesthesia for intubation during induction without neuromuscular blocking agents in patients with neuromuscular disease and neuromuscular junction disease.

CASE REPORT

Case 1: A 72-year-old woman (hight: 154cm, weight: 65kg) with a 14-year history of multiple system atrophy (MSA) was admitted to the ward with dislocation of the temporomandibular joint. MSA had started 14 years earlier with progressive difficulty in moving and speaking. Afterwards, progression of the condition was characterized by urination disorder, dyshidrotic, sleep apnea, and rapidly worsening muscle rigidity. Administration of levodopa and anticholinergic drugs was started.

Understanding the patient was difficult because of extreme dysphonia and dysarthria. Blood pressure was 81/63 mmHg and heart rate were 71 beats/min. Cardiac and chest examinations showed no abnormalities. On chest radiography, radiological image reading was difficult because of the anterior inclination. Laboratory and electrocardiograph values were normal, as was blood biochemistry. In the operating room, routine monitoring was used. Anesthesia was induced with remifentanil 0.3 γ (0.3μg/kg/min) and propofol 70 mg. No muscle relaxants were used because of the establishment of an airway. After tracheal intubation, anesthesia was maintained with air at 3 l/min, oxygen at 1 l/min, and inhaled sevoflurane 1.2%. Arterial blood gas analysis performed 60 min after induction of anesthesia showed: pH, 7.49; $PaCO_2$, 36.7 mmHg; PaO_2, 194.8 mmHg; HCO_3^-, 28.1 mmol/L; and SaO_2 (arterial oxygen saturation) 99.8% (FiO_2, 0.4). No major problems were encountered during surgery. Bilateral arthroplasty of the temporomandibular joint and tooth extraction was performed within 219 min. Blood loss was 80 ml with urine output of 1550 ml. Postoperatively, the patient emerged from anesthesia after stopping remifentanil infusion and sevoflurane and the tracheal tube was removed after confirming clear breathing sounds without stridor. During the recovery phase after anesthesia, the patient was treated with oxygen at 3 l/min showing 97% oxygen saturation by pulse-oximetry.

Case 2: A 12-year-old woman (hight: 129cm, weight: 24kg) with spinal muscular atrophy (type II) was admitted to the ward with multiple dental caries. Spinal muscular atrophy had started 8 months earlier with progressive difficulty in moving and speaking. Afterwards, progression of the condition was characterized by respiratory malfunction, dyshidrotic, sleep apnea, and rapidly worsening muscle rigidity. The patient was applied with BiPAP treatment during sleep in the last 9 years old. Anesthesia was induced with remifentanil 0.25 γ (0.25μg/kg/min) and propofol 30 mg and nasal intubation was performed without muscle relaxants. After tracheal intubation, anesthesia was maintained with air at 3 l/min, oxygen at 1 l/min plus continuous infusion of propofol (7~8mg/kg/hr) and remifentanil 0.25 γ (0.25μg/kg/min).

Case 3: A 20-year-old woman (hight: 161cm, weight: 47kg) with Charcot-Marie-Tooth disease with hereditary motor and sensory neuropathy was admitted to underwent resection of amelobrastoma. Anesthesia was induced with remifentanil 0.5γ (0.5μg/kg/min), propofol (5μg/ml) and fentanyl (1ml) thereafter nasal intubation was performed without muscle relaxants. After tracheal intubation, anesthesia was maintained with air at 3 l/min, oxygen at 1 l/min plus continuous infusion of propofol (3μg/ml) and remifentanil 0.2γ (0.2μg/kg/min).

DISCUSSION

The management of anesthesia induction in patients with neuromuscular disease and neuromuscular junction disease, such as multiple system atrophy, muscular dystrophy would be carefully planned and performed. Our experiences in three cases indicate that an anesthetic management of a patient with muscular disease using the combination of continuous infusion of propofol and remifentanil without neuromuscular blockade during induction of general anesthesia can be alternative method for the patients with neuromuscular disease and neuromuscular junction disease.

Patients with MSA including Shy-Drager Syndrome (SDS), Olivopontocerebellar Atrophy (OPCA) and Striatonigral

Degeneration (SND) are frequently known to show autonomic failure. Problems encountered in the general anesthesia management of MSA patients include hypotension, delayed efficacy of muscle relaxants and airway obstruction due to paralysis of the cricoarytenoideus posticus muscle. For general anesthesia in MSA patients, the management of the cardiovascular and respiratory systems is a concern. Patients with spinal muscular atrophy and with Charcot-Marie-Tooth disease would also have risk factor of significant weakness of muscle tone in pharyngeal regions. This cause malfunction of upper airway dilator muscles and swallowing related muscles.

A patient with neuromuscular disease and neuromuscular junction disease may show abnormal reactivity to muscle relaxants, and careful attention with use is therefore required. A depolarizing muscle relaxant should not be used, as cardiac arrest may result from hyperkalemia. Conversely, non-depolarizing muscle relaxants need time to achieve sufficient muscle relaxation, and muscle relaxation may be prolonged to the time of planned extubation. In these cases, we secured the airway without using a muscle relaxant. Extubation was performed on the appearance of spontaneous breathing and muscle strength, i.e., tongue prominence and an opening mouth. These patients often show snoring associated with symptoms of stridor during sleep due to laryngeal dystonia. The mechanism of laryngeal dystonia has been recognized to be associated with incorrect coactivation of the adductors and abductors of the vocal cords [12]. Previous studies have revealed both palsy and hypertonicity of the vocal cord muscles [13,14]. The airway obstruction during inspiration generated during sleep can become a cause of obstructive sleep apnea syndrome and sudden death. Upper airway obstruction has been suggested as a potentially critical determinant during induction of and emergence from general anesthesia [15,16]. The presence of findings such as inspiratory wheezing at the time of sleep, strange breathing, apneic episodes, and falling SpO_2 thus need to be carefully watched for intraoperatively [17-19].

As previously reported, the efficacy of remifentanil for management anesthetic induction without muscle relaxant agent would be confirmed. The combination of remifentanil (0.25~0.5μg/kg/min) and propofol (1mg/kg) would provide safe and effective anesthetic condition for nasal intubation during induction.

In these cases, no major problems with upper airway patency were encountered during induction of and emergence from anesthesia. However, we observed transient desaturation under room air conditions associated with patient's feeling of dyspnea during the first 2 days postoperatively in case 1. Although the patient did not complain of any significant dyspnea, intubation may risk malfunction of the vocal cords after general anesthesia. We cannot rule out the possibility of a major influence of edema due to operative procedures. In this case, continuous supplementation with oxygen (3 l/min) may have improved the respiratory condition through maintenance of normal oxygen saturation. As reported previously, application of continuous positive pressure [20] or high nasal flow may be sufficient to produce sufficient positive pressure to improve upper airway collapsibility due to weakness of the upper airway dilator muscles in the laryngeal region.

CONCLUSION

We have experienced three cases of an anesthetic management using continuous infusion of remifentanil and propofol for a patient with muscular disease without neuromuscular blockade during induction of general anesthesia. It in noted that an anesthetic management of a patient with muscular disease without neuromuscular blockade during induction of general anesthesia can be alternative method for the patients using remifentanil with neuromuscular disease and neuromuscular junction disease.

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