

Rocuronium-Induced Generalized Spontaneous Movements Cause Pulmonary Aspiration

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Rapid-sequence induction with cricoid pressure is a standard procedure for inducing anesthesia in patients with a potentially full stomach. During the induction period, if the patient develops generalized movements of the body, the pressure level of the cricoid may change unexpectedly. As a result, the increase in intragastric pressure may cause gastric regurgitation and consequent pulmonary aspiration. Rocuronium has been widely used as an alternative to succinylcholine during the induction of anesthesia. However, most patients who received rocuronium complained of severe burning pain in their arm during intravenous injection. Even after the administration of the induction agents, rocuronium injection can also cause withdrawal of the hand or other generalized movements of the body. We describe a case of gastric regurgitation with pulmonary aspiration following generalized spontaneous movements associated with rocuronium injection in a girl who received pediatric emergent surgery. (*Chang Gung Med J* 2002;25:617-20)

Key words: rocuronium, movements, pain, complication, aspiration, rapid-sequence induction.

Most patients who receive rocuronium complain of severe burning pain in their arm during intravenous (IV) injection.^(1,2) Even after the administration of induction agents, rocuronium injection can also cause withdrawal of the hand or other generalized movements of the body. These phenomena may be due to pain in response to the injection.^(3,4) Little is known regarding the mechanism underlying this withdrawal movement. We report a case in which IV injection of rocuronium during the induction phase caused pulmonary aspiration with gastric regurgitation secondary to generalized spontaneous movements.

CASE REPORT

A 5-year-old girl (body weight of 20 kg), American Society of Anesthesiologists physical sta-

tus I, was scheduled for open reduction with internal fixation of a left humeral fracture. She had no history of gastroesophageal reflux or other remarkable disorders. Preoperative laboratory data were within normal ranges. She drank cow's milk (100 ml) 8 hours before and clear water (50 ml) 6 hours before induction of anesthesia. In the operating room, routine monitors were placed on the patient. An IV catheter (22#) was placed in the dorsum of the right hand. She was premedicated with 0.2 mg of atropine IV. After 3 min of preoxygenation, cricoid pressure was applied. Rapid-sequence induction was commenced after IV administration of thiopental (125 mg) and rocuronium (15 mg). Unfortunately, generalized movements of the extremities, involving the neck and head, were noted following rocuronium injection. The facemask was immediately removed because gastric regurgitation of creamy material was

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Received: Oct. 31, 2001; Accepted: Dec. 31, 2001

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found in the patient's mouth and nose. Her head was made to tilt down, and the trachea was immediately suctioned. Laryngoscopy showed a residual amount of the same material in the pharynx. The trachea was intubated with a 5.0-gauge cuffed endotracheal tube. About 5 ml of creamy material was suctioned out. Auscultation of the chest revealed rhonchi over the upper region with a decrease in breathing sounds of the right lung. However, fiberoptic bronchoscopy showed no significant obstruction of either lung by the regurgitate. Arterial blood gases (FiO₂ 100%) revealed a pH of 7.30, PaO₂ of 94 mmHg, PaCO₂ of 52 mmHg, and oxygen saturation of 96%. Anesthesia was maintained with 3%-4% of an inspired concentration of sevoflurane in 100% oxygen. The operation was uneventfully completed within 1 hour. During the operative period, the oxygen saturation measured by pulse oximetry ranged between 94% and 97%. The patient was then sent to the pediatric intensive care unit where her ventilation was supported by a mechanical respirator. A chest roentgenogram showed an area of consolidation in the upper lobe and some infiltrates in the lower lobe of the right lung. On the postoperative second day, the patient was stable with significant improvement in arterial blood gases and chest roentgenogram. At that time, she was weaned from the ventilator, and was extubated. She was transferred to the general ward on the postoperative third day, and was discharged from the hospital with no sequelae on the seventh postoperative day.

DISCUSSION

Rapid-sequence induction with cricoid pressure is a standard procedure during the induction of anesthesia in patients with a potentially full stomach.⁽⁵⁾ During the induction period, if the patient develops generalized movements of the body, the pressure level of the cricoid may change unexpectedly. As a result, increased intragastric pressure^(6,7) may cause gastric regurgitation and consequent pulmonary aspiration.⁽⁸⁾ We herein describe a case of gastric regurgitation with pulmonary aspiration following generalized spontaneous movements associated with rocuronium injection in a girl who received pediatric emergent surgery.

Among the nondepolarizing muscle relaxants, rocuronium bromide has the fastest onset. It has

been widely used as an alternative to succinylcholine during the induction of anesthesia where rapid tracheal intubation is required.^(9,10) However, several lines of evidence indicate that injection of rocuronium produces severe burning pain in the arm, or generalized movements of the body. The latter phenomenon is thought to be due to painful stimulation induced by the IV injection of rocuronium.^(3,4) Shevchenko et al. showed that the incidence of withdrawal was 84%, while that of generalized movements (present in more than 1 extremity, coughing, or breath-holding) were 48%.⁽³⁾ The cause of pain on IV injection of rocuronium is still undetermined. Several mechanisms have been suggested including the low pH of the injected solution,⁽¹¹⁾ a direct irritant effect, or mediators of the kininogen cascade.⁽⁴⁾ However, very little evidence has been submitted. Many methods have been suggested to reduce the severity and incidence of rocuronium-induced pain or withdrawal movements.^(3,12) Shevchenko et al. reported that this reaction could be attenuated by pretreatment with IV lidocaine. However, this kind of pretreatment was unable to completely prevent these adverse effects.⁽³⁾ Joshi et al. reported that fentanyl (100 µg) in combination with midazolam (2 mg) was effective in preventing the pain.⁽¹⁾ However, premedication with fentanyl or midazolam was deemed to be unsuitable for patients with an increased risk of aspiration.⁽⁸⁾

In conclusion, pain on injection of rocuronium can be significant. The associated movements during anesthesia induction can elicit gastric regurgitation with resultant pulmonary complication in patients with a potentially full stomach.

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注射安心麻儂誘發之躁動引起吸入性肺炎

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針對胃排空時間不足之病患，施行麻醉時，經常會使用到環狀軟骨壓迫法合併快速誘導麻醉。但若於麻醉誘導期間，任何使病患引起躁動之因素可能會改變環狀軟骨上的壓力和方向，甚至增加胃內壓而引發胃內容物之逆流，而導致吸入性肺炎。我們報告一例，五歲女童因骨折而安排緊急手術。於麻醉誘導期間，由於靜脈注射安心麻儂後引起的疼痛誘發之躁動，導致吸入性肺炎的病例。(長庚醫誌 2002;25:617-20)

關鍵字：安心麻儂，躁動，疼痛，併發症，吸入性肺炎，快速誘導。