Severe aspiration pneumonitis in a patient without risk factors during monitored anesthesia care for a brief manipulation: A case report

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Abstract

In general, pulmonary aspiration during anesthesia can occur in patients who have several risk factors. The practical reports of risk-free cases during short periods of light sedation or monitored anesthesia care (MAC) are limited. Herein, a 60-year-old healthy male patient underwent brief manipulation under MAC, preceded by preoperative fasting. He had no risk factors for aspiration. The procedure was completed in 10 min under MAC using 100 mg of propofol and temporary 2-3% sevoflurane, without the airway securing. Prior to awakening, he vomited a small amount of gastric contents. His respiratory state was stable 30 min after that. However, 60 min later, he developed aspiration pneumonitis. His respiratory condition deteriorated rapidly, and 150 min later, he developed acute respiratory distress syndrome (ARDS). In addition to mechanical ventilation as a lung protective strategy, methylprednisolone, simvastatin sodium, and antibiotics were administered continuously. The following day, the patient showed a marked improvement. In conclusion, MAC during a brief surgical procedure like using 100 mg of propofol and 2-3% sevoflurane without the airway securing can be a serious risk factor of perioperative regurgitation and pulmonary aspiration, even if a risk-free patient follows the preoperative fasting procedure. In addition, even if patient’s condition is stable immediately after aspiration, aspiration pneumonitis may occur for a short time and deteriorate to ARDS rapidly.

Key words: Aspiration pneumonitis, Pulmonary aspiration, Monitored anesthesia care

Introduction

Pulmonary aspiration during anesthetic management is a relatively rare event, occurring in only 0.01%-0.03% of cases[1,2]. However, it is a serious adverse event. The inflammatory response to gastrointestinal contents is categorized as aspiration pneumonitis, and in severe cases, an excessive inflammation reaction can cause acute respiratory distress syndrome (ARDS). In general, pulmonary aspiration during anesthesia occurs only in patients who have several risk factors such as those related to their own pathological status, their preoperative fasting state, or the anesthetic and operative method. In theory, it is possible for aspiration pneumonitis to occur in patients with no risk factors during a short period of sedation or monitored anesthesia care (MAC), but there has been no practical reports of this to the best of my knowledge.

Here, I report the case of a patient with no risk factors who experienced rapid onset aspiration pneumonitis, which rapidly worsened to ARDS, caused by the regurgitation of gastric contents under MAC during a short period.

Case presentation

The patient was a 60-year-old man (height, 177 cm; weight, 70 kg) with a 10-year history of hyper-
tension, but had no aspiration-susceptible pathology. He underwent left total hip replacement for idiopathic necrosis of femoral head two years previously, but dislocation of the artificial hip joint had occurred three times within the past year. Each time, this had been reduced easily with brief manual manipulation under MAC using propofol or/and sevoflurane.

This time, he experienced fourth dislocation of his left artificial hip joint the day before the operation. On the day of the operation, he attended the hospital at 9:00 a.m. with the manual manipulation under MAC scheduled at 2:00 p.m. His general status was favorable, and he did not vomit or feel nausea, though having coxalgia in the pre-anesthetic physical examination. As the patient understood well the importance of preoperative fasting, he had consumed no food as solid matter since 9:00 p.m. the previous evening. And after admission, he had ingested only 200-300 mL of clear liquid at 3 h before his arrival in the operating room. As it was expected that the manual manipulation would be finished within a few min, I planned intravenous anesthesia using propofol as MAC under spontaneous breathing, without the use of airway management devices such as a laryngeal mask airway; this was the same as for the patient’s previous three MACs for the manual manipulation.

Premedication including H2 blocker or gastric antacid was not done. On arrival at the operating room, the patient’s vital signs were stable. Supplemental oxygen (10 L/min) was provided via a facemask throughout the procedure. He was gradually administered 100 mg of propofol by taking 1 min, which resulted in the loss of consciousness, followed by 50 mg of flurbiprofen axetil. Temporary respiratory depression owing to glossoptosis occurred, but spontaneous breathing and oxygenation was favorably maintained with temporary jaw-lift.

The manual manipulation was started. However, body movement occurred, disturbing the procedure. Additional inhalation anesthesia using 2.3% sevoflurane was therefore administered via the facemask. And temporary manual bag ventilation was performed a few times over a short period without difficulty. Capnometer was not used during MAC. But, there were no symptoms that air or gas entered into stomach, and the patient did not have regurgitation at least in appearance. The manipulation finished after 10 min. Sufficient spontaneous breathing was maintained after the procedure, with oxygen saturation (SpO2) maintained at 98%-100%. A few min later, while waiting for the patient to regain consciousness, I noticed a small amount of serous and brown vomiting, which was suspected to be gastric juices, flowing from the corner of his mouth under the mask. I rapidly aspirated his oral cavity, but only a small amount of liquid could be sucked out. This stimulation quickly woke him and he had a fit of intense coughing. He was able to expectorate phlegm by himself and vocalize clearly. He did not develop dyspnea and no abnormal wheezing was heard with a stethoscope. I observed his respiratory condition for 30 min; his SpO2 remained at 98%-100% with 10 L/min of supplemental oxygen. His hemodynamics also remained stable. As he was also able to breathe spontaneously with no complaints of dyspnea, he was transferred to the surgical ward.

The following patient’s clinical course is shown in Fig. 1. At 60 min after regurgitation, the patient complained of dyspnea. Wheezing was heard with auscultation, and his SpO2 was now 95% with 10 L/min of supplemental oxygen. Despite inhaling short-acting β-2-agonists and receiving 250 mg of aminophylline, his feeling of dyspnea increased. Thirty min later, he was unable to breathe easily except when sitting up straight (orthopnea); SpO2 was 90%-92% with 10 L/min of supplemental oxygen. Chest radiography showed a shadow on the right upper and middle lung fields (Fig. 2), and I therefore diagnosed aspiration pneumonitis. As effort respiration was severe, he was intubated and artificial respiration was started at 120 min after aspiration. The intubation was smoothly performed at bedside without difficulties using Parker endotracheal tube with 7.5 mm of internal diameter (Japan Medicalnext Co, Ltd, Osaka, Japan). At 150 min after aspiration, the ratio of partial pressure of oxygen in arterial blood (PaO2) to the fraction of inspired oxygen (FiO2) (the P/F ratio) had decreased to 60. Chest radiography showed that the
Fig. 1  The patient’s clinical course

Fig. 2  Chest radiograph obtained 90 min after the aspiration
Chest radiograph shows slight shadows in the right upper and middle lung fields.

Fig. 3  Chest radiograph obtained 150 min after the aspiration
Chest radiograph shows the pervasive shadow in the right lung extending over the whole field and a new shadow that appears in the left middle and lower lung fields.
pervasive shadow on his right lung extended across the whole field and a new shadow had appeared on his left lung (Fig. 3). There was no cardiac dilatation, and echocardiography showed normal cardiac contraction. I therefore diagnosed his condition as deteriorating to ARDS, and started the medication of methylprednisolone, sivelestat sodium, and antibiotics. In artificial respiration management, I considered an open lung approach using positive end expiratory pressure (PEEP) and low tidal ventilation that allowed permissive hypercapnia, which are lung protective strategy.

The following day, his respiratory condition improved. The wheezing on auscultation disappeared. Chest radiography showed that the shadow had gradually decreased. After 24 h post-aspiration, I changed his respiratory mode to spontaneous respiration. His hemodynamics remained stable. He was extubated on postoperative day (POD) 2, with his respiratory condition subsequently remaining stable. During intubation, the appearance of intratracheal secretion by suction were serous and clear. On POD 4, chest radiography showed a marked improvement in the lung shadow (Fig. 4). I terminated the administration of methylprednisolone and sivelestat sodium on POD 3 and POD 4, respectively. There was no subsequent deterioration of the pneumatosis. The administration of antibiotics was terminated on POD 7. His physical status was stable; and, after rehabilitation, he was discharged on POD 14, with no sequelae.

**Discussion**

The most consistent of the important risk factors for perioperative pulmonary aspiration are an inability to maintain the function of the lower esophageal sphincter, and airway protective reflexes with a pathological status, such as esophageal hiatus hernia, achalasia, and cerebral infarction sequelae. Conditions of increased gastric internal pressure such as gastrointestinal obstruction, pathologic obesity, and hyperacidity are also important risk factors. However, the patient did not have any of these risk factors.

He had followed the preoperative fasting procedure, abstaining from intake of solid matter for more than 6 h and from intake of clear fluids for more than 2 h prior to operation, as recommended by various guidelines. As the patient had undergone a similar manipulation several times previously, he was not in a state of anxiety or tension; but he complained of acute coxalgia this time, which may have caused an increase in gastric internal pressure and retention of gastric contents. Although preoperative fasting is a universally accepted method that is expected to prevent pulmonary aspiration during anesthesia to a certain degree, the evidence supporting its effectiveness is insufficient.

The timing of pulmonary aspiration during the perioperative period has been reported to be associated with manual ventilation under a mask, enlarging a larynx during anesthetic induction, or extubation after surgery, all of which can stimulate regurgitation. In the present case, I performed temporary manual ventilation under the mask for a short period when increasing the concentration of sevoflurane. At this time, it was possible for silent regurgitation and pulmonary aspiration to occur. And, in this case, during half awake after MAC, there was only a small amount of vomitus in appearance. Many cases of aspiration pneumonitis involve a large amount of vomitus, and most authors agree that the development

![Chest radiograph on POD 4](image-url)
of aspiration pneumonitis requires a volume of gastric aspirate greater than 0.3 mL/kg (20-30 mL in adults)\(^6\). In this case, the practical amount of silent aspiration might be also larger than I expected. The stimulation of oral cavity aspiration when regurgitation woke the patient, and immediately made his cough reflex occur. He was able to expectorate phlegm well by himself. So, I thought that it would not unlikely that its stimulation caused further pulmonary aspiration, though being risk factor of regurgitation.

The patient’s respiratory condition was stable immediately after pulmonary aspiration, and clinical manifestations such as dyspnea, tachypnea, and wheezing appeared 1 h after aspiration, followed by rapid exacerbation to ARDS 1.5 h after that. Lung injury after pulmonary aspiration follows a biphasic pattern. The first phase peaks at 1 to 2 h after aspiration and is presumably results directly from the caustic effect of the low pH of the aspirate. The second phase peaks at 4 to 6 h\(^6\) and is associated with the infiltration of neutrophils into the alveoli and lung interstitium, in which various substances such as cytokines and complements are produced\(^7\). At worst, this can result in deterioration and the onset of ARDS. However, there have been no reports of ARDS occurring rapidly within a few hours after pulmonary aspiration, such as with the present case. In this patient, preoperative physical status was well favorable, but the pH of gastric contents may have decreased because gastric juices could be well not neutralized by food due to the preoperative fasting. And the reason why the pulmonary aspiration became exacerbated to ARDS is suspected due to the lower of pH of vomitus than expected.

About 30% of aspiration pneumonitis deteriorates to ARDS, which is associated with high mortality\(^6\). Warner et al.\(^1\) reported an extremely high mortality rate in patients with ARDS caused by aspiration pneumonitis who require artificial respiration for longer than 24 hours; however, all patients withdrawn from artificial respiration within 24 h survived. As yet, there is no effective treatment for ARDS supported by clinical evidence. In the present case, in addition to mechanical ventilation as a lung protective strategy, I administered methylprednisolone, sivelestat sodium (the selective antagonist against neutrophil elastase), and antibiotics, starting immediately after the onset. The patient showed a marked improvement from the following day. The use of steroids and sivelestat sodium for ARDS has been controversial\(^9,10\). However, given that the strategy of ARDS is the downregulation of neutrophil activity and severe inflammatory response\(^11\), the early administration of these medications may be effective.

In this case, the patient did not experience complication with bacterial pneumonia. However, bacterial pneumonia as a late phase of lung injury can often occur a few days after pulmonary aspiration\(^6\). Antibiotics are not effective for the first phase of aspiration pneumonitis, but prophylactic empirical administration in an early phase of antibiotics that cover a wide spectrum may be effective for secondary bacterial pneumonia, although there has been no evidence to support this.

Since this event, I have made it a rule to perform tracheal intubation during the anesthetic management of orthopedic manual manipulation, and administer H2 blocker or gastric antacid as premedication, no matter how brief the surgical procedures are.

**Conclusions**

MAC like using 100 mg of propofol and 2-3% sevoflurane without the airway securing by endotracheal intubation and laryngeal airway mask insertion, can be a serious risk factor of perioperative regurgitation and pulmonary aspiration during a brief surgical procedure, even if a risk-free patient follows the preoperative fasting procedure. In addition, even if patient’s condition is stable immediately after aspiration, sever aspiration pneumonitis, which deteriorate to ARDS rapidly, may occur for a short time.

**Consent**

Written informed consent was obtained from the patients for publication of this case report and any accompanying images.

**Competing interests**

The author declares having no competing interests.
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