

# The Obesity: Can it be the only factor of pulmonary aspiration during the induction of general anesthesia?

- A case report -

**Hye Jin Kim, Hye Young Shin, Jong Cook Park, and Sang Hyun Park**

Department of Anesthesiology and Pain Medicine, Jeju National University School of Medicine, Jeju, Korea

## Abstract

During perioperative period, pulmonary aspiration is rare but has significant morbidity and mortality. Therefore, we should keep in mind and try to prevent it.

In this case that we report, even in the patient fasting 12 hours, adequate fasting before elective surgery, the patient with no risk factor except obesity (body mass index  $34.9 \text{ kg/m}^2$ ) underwent pulmonary aspiration. It suggests that obesity can be the only independent factor associated with pulmonary aspiration. Thus, we should be aware of unexpected aspiration pneumonia and should be particularly caution when performing induction of anesthesia in dealing with patients who are obese. (J Med Life Sci 2010;7:48-51)

**Key Words :** Airway management, Aspiration pneumonia, Obesity

## Introduction

Pulmonary aspiration is common in patients under general anesthesia, most frequently during induction, as compared to neuraxial or regional anesthesia<sup>1)</sup>. During perioperative period, it is rare but it has significant morbidity and mortality. Associated factors for aspiration include after-hours procedures, extremes of age, gastrointestinal or abdominal procedures, impaired consciousness, lithotomy position and obesity<sup>2)</sup>.

Meanwhile, obesity appears to be a contributing factor in several studies for pulmonary aspiration of gastric contents. Presumed increased intra-abdominal pressure, high residual gastric volume, low pH, delayed gastric emptying and gastro-esophageal reflux disease increases the risk of aspiration pneumonitis in the obese patient<sup>3)</sup>, though recent studies have presented the data to disprove it<sup>4-5)</sup>.

We report a case in which aspiration pneumonitis occurred during mask fitting for intubation, although this patient had no known risk factors for gastric content aspiration except obesity and had fasted for about 12 hours.

## Case Report

A 22-year-old woman (height, 160 cm; weight, 89.4 kg; body mass index,  $34.9 \text{ kg/m}^2$ ) diagnosed with chronic tonsillitis was scheduled for a tonsillectomy under general anesthesia. Her surgical history, medical history and physical examination were unremarkable. Her fasting time was for about 12 hours.

On the day of surgery, after application of routine monitoring, anesthesia was induced by lidocaine and propofol with rocuronium for neuromuscular blockade. Mask fitting ventilation was performed for 60 seconds after injecting the rocuronium. When foam at the mouth was seen, her mouth was opened for suction. Then nearly clear fluid was visible in her oral cavity. Her head was turned to the side promptly and the oral cavity was suctioned sufficiently. The trachea was intubated with a 7.5 mm oral RAE tube. Her oxygen saturation ( $\text{SpO}_2$ ) was 98%. Quickly suction through the endotracheal tube was performed. Intraoperative anesthesia was maintained with oxygen (2.0 L/min), nitrous oxide (2.0 L/min) and desflurane (6-7 vol%). During surgery, oxygen saturation was maintained between 98-99%.

The surgery was completed within 1 hour. Anesthetic management and recovery presented no complication. The tracheal tube was removed when she responded to verbal

Address for correspondence : Hye Jin Kim  
Department of Anesthesiology and Pain Medicine, Jeju National University School of Medicine, 66 Jejudaehakno, 690-756, Jeju, Korea  
E-mail : hjkim@jejunuh.co.kr

## Discussion

commands and showed sufficient spontaneous respiration and neuromuscular function. She remained in post-anesthetic care unit (PACU) for 25 minutes event free. Her vital signs were stable without any problems ( $SpO_2 > 99\%$ ). And she was then transferred to general ward. A postoperative posteroanterior chest X-ray was taken (Fig.1). Based on this imaging finding, aspiration was highly suspected. In her room, she felt mild chillness. Fever set in a few hours later. She received changed empirical antibiotic treatment to fluoroquinolone. Pneumonia was under control and the fever subsided gradually. After 3 days of medical treatment, pneumonia was improved and she was discharged in a stable condition.



**Figure 1.** The chest X-ray showed patchy consolidation in the right middle lung zone due to aspiration.

Aspiration is defined as the inhalation of oropharyngeal or gastric contents into the larynx and lower respiratory tract. Pulmonary aspiration was confirmed in 1 in 8,600 anesthetic procedures in a recent review<sup>6)</sup> and accounted for 4% of claims in the ASA Closed Claims Study<sup>7)</sup>. Risk factors for aspiration of gastric contents include pregnancy, acute gastrointestinal disease (esophageal or gastric disease, small bowel obstruction, and ileus), trauma, diabetes, and obesity. In addition, recent ingestion of food is a risk factor. But fasting from the midnight before surgery to any time in the following day is thought to be excessive<sup>8)</sup>. Pulmonary aspiration can be classified into two distinct clinical entities, aspiration pneumonitis and aspiration pneumonia<sup>9)</sup>. The differences between aspiration pneumonitis and aspiration pneumonia are summarized in Table 1. In this case, the aspirate was liquid, which is associated with pneumonitis.

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health. Body mass index (BMI), defined as the weight in kilograms divided by the square of the height in meters ( $kg/m^2$ ), is a simple index of body fat in adults. In 2006, according to WHO recommendation on the basis of the available data in Asia (Table 2), Korean Society for the Study of Obesity (KSSO) updated guideline for body weight classification in adults. Within this framework, Korean adults are considered overweight if their body mass index (BMI,  $kg/m^2$ ) is 23 or greater, and obese if their BMI is 25 or greater. Obesity is further separated into 2 classes

**Table 1.** Comparison of Features of Aspiration Pneumonitis and Aspiration Pneumonia<sup>10)</sup>

	Aspiration pneumonitis	Aspiration pneumonia
Mechanism	Aspiration of sterile gastric contents	Aspiration of colonized oropharyngeal material
Pathophysiologic process	Acute lung injury arising from acidic and particulate gastric material	Acute pulmonary inflammatory response to bacteria and bacterial products
Bacteriologic findings	Initially sterile, with subsequent bacterial infection possible	Gram-positive cocci, Gram-negative rods, and (rarely) anaerobic bacteria
Main predisposing factors	Markedly depressed level of consciousness	Dysphagia and gastric dysmotility
Age group affected	All age groups, but usually young persons	Usually elderly persons
Aspiration event	May be witnessed	Usually not witnessed
Typical presentation	Patient with a history of a depressed level of consciousness in whom a pulmonary infiltrate and respiratory symptoms develop	Institutionalized patient with dysphagia in whom clinical features of pneumonia and an infiltrate in a dependent bronchopulmonary segment develop
Clinical features	No symptoms or symptoms ranging from a nonproductive cough to tachypnea, bronchospasm, bloody or frothy sputum, and respiratory distress 2-5 hours after aspiration	Tachypnea, cough, and signs of pneumonia

**Table 2.** Proposed Classification of Weight by BMI in Adult Asians<sup>11)</sup>

Classification	BMI (Kg/m <sup>2</sup> )	Risk of co-morbidities
Underweight	< 18.5	Low (but increased risk of other clinical problems)
Normal range	18.5 - 22.9	Average
Overweight	≥ 23.0	
At risk	23.0 - 24.9	Increased
Obese I	25.0 - 29.9	Moderate
Obese II	≥ 30	Severe

according to the increased health risk associated with increasing BMI levels : class I (BMI 25 - 29.9) and class II (BMI ≥ 30). In this case, the patient (BMI 34.9 kg/m<sup>2</sup>) is class II that is previous stage of morbid obesity<sup>11-12)</sup>. The cut-offs are lower than the WHO criteria. Despite adequate fasting before elective surgery (nil per os [NPO] after midnight), the patient with no risk factor except obesity (BMI, 34.92 kg/m<sup>2</sup>) underwent pulmonary aspiration.

Since unexpected aspiration may occur in the patient without obvious risk factor for pulmonary aspiration except obesity, we should endeavor to prevent it from occurring and minimize the damage it causes should it occur. In obese patients, we suggest that rapid sequence induction (RSI)<sup>13)</sup> and the technique of cricoid pressure should be routinely considered during induction<sup>2)</sup>. The patient lie supine with a slight head-down tilt to assist gravitational drainage of gastric contents away from the airway should regurgitation occur. Once intubation has done, 45° head-elevated position is better to prevent aspiration<sup>2)</sup>.

Meanwhile, reducing gastric acidity may help avoid severe injury resulting from massive aspiration and can be achieved by administrating proton pump inhibitors or histamine H<sub>2</sub> receptor antagonists on the day of surgery. These medications can effectively increase the gastric pH and decrease the volume of gastric juice. It is generally considered that a pH of less than 2.5 and a volume of gastric aspirates greater than 0.3 mL/Kg body weight (20-25mL in adults) may lead to aspiration pneumonia<sup>10)</sup>. The methods for preventing aspiration pneumonia are known(table 3).

In conclusion, this case reminds us that, even in the patient fasting 12 hours, obesity can be the only independent factor associated with pulmonary aspiration. Therefore, we should be aware of unexpected aspiration pneumonia and should be particularly caution when performing induction of anesthesia.

**Table 3.** Methods to Reduce Risk of Regurgitation and Pulmonary Aspiration<sup>13)</sup>

1. Minimize intake	Adequate preoperative fasting Clear liquids only if necessary
2. Increase gastric emptying	Prokinetics(e.g., metoclopramide)
3. Reduce gastric volume and acidity	Non-particulate antacid (e.g., sodium citrate) H <sub>2</sub> -receptor antagonists (e.g., famotidine) Proton pump inhibitors (e.g., lansoprazole)
4. Airway management and protection	Cricoid pressure Cuffed endotracheal intubation Esophageal-tracheal combitube Proseal laryngeal mask airway

### References

- 1) Cheney FW: Aspiration: a liability hazard for the anesthesiologist? ASA Newsletter June 2000;64:1-3.
- 2) Kalinowski CP, Kirsch JR: Strategies for prophylaxis and treatment for aspiration. Best Pract Res Clin Anesthesiol 2004 Dec;18(4):719-737.
- 3) Vaughan RW, Bauer S, Wise L: Volume and pH of gastric juice in obese patients. Anesthesiology 1975;43:686-689.
- 4) Harter RL, Kelly WB, Kramer MG, Perez CE, Dzwonczyk RR: A comparison of the volume and pH of gastric contents of obese and lean surgical patients. Anesth Analg 1998;86:147-152.
- 5) Zacchi P, Mearin F, Humbert P, Formiguera X, Malagelada JR: Effect of obesity on gastroesophageal resistance to flow in man. Dig Dis Sci 1991;36(10):1473-80.
- 6) Neelakanta G, Chikyarappa A: A review of patients with pulmonary aspiration of gastric contents during anesthesia reported to the Departmental Quality Assurance Committee. J Clin Anesth 2006;18:102-107.
- 7) Lee LA, Domino KB: The closed claims project. Has it influenced anesthetic practice and outcome? Anesthesiol Clin North Am 2002;20:485-501.
- 8) Maltby JR: Fasting from midnight - the history behind the dogma. Best Pract Res Clin Anaesthesiol 2006;20:363-378.
- 9) Marik PE. Aspiration pneumonia and aspiration pneumonia. N Engl J Med 2001;344(9):665-71.
- 10) Lai PJ, Chen FC, Ho ST, Cheng CH, Liu ST, Hsu CH: Unexpected pulmonary aspiration during endoscopy under intravenous anesthesia. Acta Anaesthesiol Taiwan

- 2010;48(2):94-8.
- 11) Steering Committee of the WHO Western Pacific Region, IASO & IOTF. The Asian-Pacific Perspective: Redefining Obesity and Its Treatment. Australia, 2000.
  - 12) WHO expert consultation: Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet 2004;363:157-63.
  - 13) TH Kang, KM Lee, SE Lee, YW Kim, SH Lim, JH Lee, et al.: Aspiration pneumonitis after a 10-hours fast in a patient who had undergone subtotal gastrectomy. Korean J Anesthesiol 2008;55:376-9.