

CONFLICT OF INTEREST: NONE DECLARED

ORIGINAL PAPER

Propofol Results in Higher Incidence of Bronchoconstriction in Allergic Patients

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Introduction: Some reports showed allergic reaction to propofol. However, propofol has bronchodilating effect. The purpose of this study was to elucidate whether propofol is safely used for patients with allergy or bronchial asthma. **Methods:** Seventy females with bronchial asthma or allergic diseases and 70 females without any allergic diseases for mastectomy were randomly allocated to propofol group (Propofol-allergy group and Propofol-non-allergy group) or sevoflurane group (Sevoflurane-allergy group and Sevoflurane-non-allergy group). In the propofol group, anesthesia was induced with propofol and fentanyl, and maintained with propofol, fentanyl and 50 % nitrous oxide in oxygen. In the sevoflurane group, anesthesia was induced with sevoflurane, 50 % nitrous oxide in oxygen and fentanyl, and maintained with sevoflurane and 50 % nitrous oxide in oxygen. Laryngeal mask airway was inserted. Wheezing detected by auscultation, increase of inspiratory pressure and change of the waveform of end-tidal carbon dioxide, and allergic reaction detected by skin rash during anesthesia were compared among the groups. **Results:** The number of patients who had wheezing was significantly larger in Propofol-allergy group than in other groups. **Conclusions:** Propofol might induce bronchoconstriction with a higher incidence in allergic patients than in non-allergic patients, and than sevoflurane. **Key words:** general anesthesia, propofol, allergy, bronchial asthma, bronchoconstriction

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1. INTRODUCTION

Propofol is formulated in an emulsion with intralipid containing soybean oil, glycerol and purified egg phosphatide. Therefore, patients with allergy to soybean or egg will have a risk to induce allergic reaction to propofol. A boy who had allergies to egg, peanut oil, and mold developed anaphylaxis to propofol (1). We think that not only the patients with allergy to soybean or egg, but also the patients with any other allergic diseases should be carefully administered propofol because we experienced two cases of bronchospasm with propofol, who had a history of only allergic rhinitis or atopic dermatitis (2).

In contrast, propofol has a direct bronchodilating effect (3), and pre-

vented fentanyl induced bronchoconstriction (4) and inhibited postoperative bronchospasm in patients with hyperreactivity (5). Therefore, propofol is considered to be safe in patients with bronchial asthma. However, we could not find any clinical studies to evaluate the safety of propofol in patients with bronchial asthma or allergic diseases. Therefore, the present study was performed to investigate the incidence of respiratory and allergic events with propofol in patients with allergic diseases.

2. METHODS

After the approval of the Ethics Committee of the hospital and informed consent from patients, 70 females with bronchial asthma or aller-

gic diseases and 70 females without any allergic diseases for partial mastectomy aged 40 to 60 years were enrolled in this study. Those who had cerebral, liver, renal, respiratory (except for bronchial asthma) or cardiac diseases, alcohol abuse, or taking any drugs affecting immune system such as anti-cancer agents in recent one year were excluded. Those who had asthmatic attack or active allergic rhinitis in recent one month were also excluded. Seventy patients with bronchial asthma or allergy were randomly allocated to propofol group (propofol-allergy group) or sevoflurane group (sevoflurane-allergy group), and the other 70 without allergy were also randomly allocated to propofol group (propofol-non-allergy group) or sevoflurane group (sevoflurane-non-allergy group) by an envelope method. Each group had 35 patients.

No premedication was given. Before anesthesia induction, chest auscultation was performed to confirm no wheezing. In the propofol group, anesthesia was induced with propofol (Diprivan™, Astra Zeneca Japan, Osaka, Japan) 2 mg/kg and fentanyl 2 µg/kg, and maintained with propofol 2 – 5 mg/kg/h and fentanyl 2 µg/kg with 50 % nitrous oxide in oxygen. In the sevoflurane group, anesthesia was induced with sevoflurane 5 % with 50 % nitrous oxide in oxygen and fentanyl 2 µg/kg, and maintained with sevoflurane 1.5 – 2.5 % with 50 % nitrous oxide in oxygen. Propofol or sevoflurane administration was controlled to keep bispectral index between 40 and

	Propofol-allergy (n = 31)	Propofol-non- allergy (n = 35)	Sevoflurane- allergy (n = 32)	Sevoflurane- non-allergy (n = 35)
Bronchial asthma	11	0	12	0
Pollen allergy	18	0	15	0
Allergic dermatitis	3	0	2	0
Drug allergy Pyrazolone Antibiotics	3 2	0 0	4 2	0 0
Age (years)	52 ± 6	49 ± 7	49 ± 9	50 ± 8
Body weight (kg)	58 ± 10	56 ± 8	54 ± 7	58 ± 7
Height (cm)	154 ± 10	156 ± 9	156 ± 12	155 ± 10
Duration of Anesthesia (min)	86 ± 12	78 ± 18	76 ± 17	72 ± 20
Total consumption of propofol (mg)	320 ± 30	318 ± 30	0	0
Total consumption of sevoflurane (mL)	0	0	58 ± 13	52 ± 17
Total consumption of fentanyl (µg)	230 ± 18	222 ± 24	120 ± 17	116 ± 19
Total consumption of nitrous oxide (L)	170 ± 17	163 ± 20	150 ± 21	155 ± 21

Table 1. Demographic data Data are shown as mean ± standard deviation or number of the patients. Sevoflurane consumption was measured directly. The number of patients with each allergic disease was not statistically different between propofol- allergy group and sevoflurane-allergy group. Anesthetic consumptions were not different between allergy group and non-allergy group both in propofol and sevoflurane anesthesia. Other demographic data were not different among the groups.

	Propofol-allergy (n = 31)	Propofol-non- allergy (n = 35)	Sevoflurane- allergy (n = 32)	Sevoflurane- non-allergy (n = 35)
Wheezing	10*	2	2	1
Skin rash	3	2	0	0

Table 2. Allergic reactions The number of patients is shown. *: P < 0.05 vs. other three groups

60. Laryngeal mask airway # 3 was inserted and patients were ventilated with tidal volume of 8 mL/kg at 10 breaths/min using conventional ventilator in anesthesia machine.

Wheezing detected by auscultation, sudden increase of inspiratory pressure and change of the waveform of end-tidal carbon dioxide, and allergic reaction detected by skin rash during anesthesia were checked and compared among the groups.

Power analysis was performed to detect power of 0.90 for the incidence of wheezing or asthmatic attack using the G Power™ (version 3.03, University Mannheim, Germany), and showed to-

tally 132 patients were necessary. Therefore, we included 140 patients. Statistical analysis was performed with factorial analysis of variance for age, body weight, height, duration of anesthesia, and consumption of anesthetics, and chi-square test for number of the patients. A p value less than 0.05 was considered to be statistically significant.

3. RESULTS

Four patients in propofol-allergy group and 3 in sevoflurane-allergy group had egg allergy, therefore, they were excluded from the study. Demographic data were not different among the groups (Table 1). Consumption of

anesthetics were not different between allergy and non-allergy groups in both propofol and sevoflurane anesthesia (Table 1). The number of patients who showed wheezing was significantly larger in Propofol-allergy group than in other groups (Table 2).

4. DISCUSSION

In the present study, the incidence of wheezing during propofol anesthesia in allergic patients was significantly higher than that in non-allergic patients and that during sevoflurane anesthesia in allergic patients.

We did not perform any tests to detect allergic reaction such as skin test, measurement of immunoglobulin, etc. Therefore, whether the wheezing and skin rash we observed were allergic reactions was not confirmed. However, a significant difference of the incidence of wheezing between propofol and sevoflurane anesthesia, and between allergic patients and non-allergic patients suggested that propofol induced wheezing in allergic patients. We did not study the incidence of the events in postoperative period. Therefore, we might underestimate the incidence of the events. We included bronchial asthma and other allergic diseases together in the same group because of the small number of the patients studied.

The incidence of bronchospasm during general anesthesia without specifying anesthetics was reported to be 0.8 % (6) to 6 % (7, 8) of the patients with bronchial asthma, and 0.13 % to 0.16 % of the patients without bronchial asthma (9). Therefore, bronchospasm occurs more frequently in patients with bronchial asthma during general anesthesia. In the present study, the incidence of wheezing was significantly higher than in non-allergic patients and allergic patients received sevoflurane. Therefore, propofol induced respiratory events more frequently in allergic patients than sevoflurane, while Pizov et al. reported that none in asthmatic patients, but 3 % in non-asthmatic patients wheezed after propofol induction (10).

Propofol induced concentration dependent relaxation of precontracted isolated tracheal smooth muscle of guinea pigs (11). Propofol has vagolytic effects (12) and inhibits acetylcholine

release (13) to reduce bronchoconstriction. Therefore, propofol might be safely used in patients with bronchial asthma. However, we observed wheezing in allergic patients with propofol, which was higher incidence than those with sevoflurane. There are some reports of propofol induced allergic reactions other than our previous two cases (2). Yamada et al. reported that rapid sequence induction with propofol in emergency surgery induced asthmatic attack in a patient with bronchial asthma (14). Bronchospasm was induced by propofol in a patient with sick house syndrome, who did not show any other signs of anaphylaxis (15).

We deleted the patients with egg allergy, but propofol is reported to be safe in the majority of egg-allergic children who do not have a history of egg anaphylaxis (16). Anaphylaxis to propofol may occur even at first exposure and this may be due to the isopropyl groups that are included in various medications and cosmetics (17). A case was reported who had an anaphylactic reaction with severe oropharyngeal edema and bronchospasm by propofol. In that case, a skin test was positive for both propofol and soybean (18). Anaphylaxis (19, 20, 21) or anaphylactoid reaction (17, 22, 23) with propofol was reported, with some cases had lung edema (20,21) and shock (20). Fortunately, we did not have such severe cases.

5. CONCLUSIONS

Propofol induced a statistically higher incidence of bronchoconstriction in allergic patients than in non-

allergic patients, and also than sevoflurane.

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