



Original Contribution

# Total intravenous anesthesia with propofol is associated with a lower rate of postoperative delirium in comparison with sevoflurane anesthesia in elderly patients



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## Abstract

**Study objective:** Postoperative delirium (POD) is a common complication of anesthesia. The incidence of POD in elderly patients ranges from 37% to 53%, and POD increases the morbidity and mortality of elderly patients. However, the effects of anesthetics on POD are not well known. The present study aimed to compare the incidence of POD resulting from propofol and sevoflurane anesthesia.

**Design:** Double-blind prospective study.

**Setting:** Operating room and postoperative recovery area.

**Patients:** Thirty patients in the sevoflurane anesthesia group and 29 in the propofol anesthesia group.

**Measurements:** Statistical analyses were performed using Microsoft Excel 2010 for Windows 7 (Microsoft Corporation, Redmond, Wash). Statistical analysis was performed using Fisher exact test and Student *t* test.

**Main Results:** The incidence of POD in the propofol anesthesia (6.9%) was significantly less than that observed in the sevoflurane anesthesia (26.7%; 038).

**Conclusion:** In comparison with sevoflurane anesthesia, propofol anesthesia is associated with a lower incidence of POD in elderly patients.

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## 1. Introduction

Postoperative delirium (POD) is a common complication of anesthesia and surgery. With recent advances in surgical and anesthetic techniques, more elderly patients are undergoing surgery. The incidence of POD in the general surgical

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population is reported to range from 37% to 46%, rising as high as 53% in the elderly [1,2]. It is essential to prevent, diagnose, and treat POD in elderly patients because deterioration of POD often contributes to an increase in morbidity and mortality [2–8]. However, as delirium is common after anesthesia and surgery, the influence of anesthetics on POD is not fully elucidated. The present study was carried out to compare the incidence of POD after propofol and sevoflurane anesthesia.

## 2. Materials and methods

After obtaining approval from the Hospital Ethics Committee and written informed consent, patients who were classified under physical status I or II by the American Society of Anesthesiologists and were 70 years or older were enrolled in this prospective study.

The patients were scheduled to undergo elective gastrectomy, colectomy, or resection under general anesthesia combined with epidural anesthesia between July 2009 and December 2010. Patients were excluded for reasons including (a) a history of dementia, depression, alcoholism, and liver cirrhosis; (b) a history of using benzodiazepine, major tranquilizers, or steroids; (c) an ineffective postoperative analgesia via epidural anesthesia; and (d) allergic reactions to local anesthetics. The induction of anesthesia was performed intravenously propofol (1–1.5 mg/kg) after the insertion of an epidural catheter. Patients in group S received sevoflurane, and those in group P received propofol to maintain general anesthesia. Patients were kept under adequate sedation with a bispectral index (BIS) ranging from 40 to 60 and hypotension (a systemic blood pressure <90 mm Hg) was avoided during anesthesia. For intraoperative analgesia, an injection of intravenous fentanyl or continuous infusion of 0.25% ropivacaine (6 mL/h) was administered via epidural catheter. After the emergence of anesthesia and extubation of the tracheal tube in the operating room, patients were transferred to the intensive care unit (ICU). In our institution, patients after laparotomy are transferred to ICU. Upon admission to the ICU, a nasogastric tube, a urinary catheter, and an epidural catheter were used in addition to the peripheral infusion catheter. The nasogastric tube was removed at the first postoperative day and the urinary catheter was removed after the third postoperative day. When required, ropivacaine and fentanyl were administered via the epidural catheter, either continuously or by injection, using the epidural analgesia algorithm, until the third postoperative day for postoperative analgesia. Postoperative delirium was diagnosed using the confusion assessment method (Table 1) by ICU nurses who were blinded to patients' group assignment.

Data are expressed as mean  $\pm$  SD. Statistical analysis was completed using Fisher exact test and Student *t* test. Values demonstrating a significance of  $P < .05$  were considered statistically significant.

**Table 1** Confusion assessment method

- Acute onset and fluctuating course  
comes on abruptly over hours to days, then comes and goes over of the day
- Inattention  
reduced ability to maintain attention or shift attention
- Disorganized thinking  
disorganized or incoherent speech
- Altered level of consciousness  
Usually lethargic or stuporous

To diagnose delirium, the first 2 features must be present, as well as 1 of the last 2.

## 3. Results

Fifty-nine patients were enrolled in this study. They were randomly assigned to group S ( $n = 30$ ) or group P ( $n = 29$ ). There were no significant differences in age, sex, operation time, anesthesia time, bleeding volume, and total dose of fentanyl during anesthesia between the 2 patient groups (Table 2). Sevoflurane with 1 to 1.5 minimum alveolar concentration and propofol with 1.5 to 3  $\mu\text{g/mL}$  effect site concentration by target controlled infusion system were needed to keep patients under adequate sedation. Eight patients in group S and 2 in group P developed POD. The incidence of POD in group P (6.9%) was significantly less than that in group S (26.7%;  $P = .038$ ). Twenty male and 10 female patients were included in group S, and 20 male and 9 female patients were included in group P. In group S, 7 of the 8 patients who developed POD were male, and in group P, both of the patients who developed POD were male. The incidence of POD in men was higher than that in women; however, the difference was not significant ( $P = .082$ ; Fig. 1).

## 4. Discussion

In this study, we observed a lower incidence of POD in elderly patients when anesthesia was maintained using propofol.

**Table 2** Characteristics of patients

	Group S	Group P	<i>P</i>
No.	30	29	
Sex (male)	20	20	.85
Age (y)	76.5 $\pm$ 4.5	77.3 $\pm$ 4.6	.25
Operation time (min)	211.0 $\pm$ 85.4	223.4 $\pm$ 65.0	.27
Anesthesia time (min)	267.5 $\pm$ 85.3	281.8 $\pm$ 67.6	.24
Bleeding volume (g)	206.3 $\pm$ 234.7	134.7 $\pm$ 117.8	.073
Fentanyl (mL)	3.9 $\pm$ 1.9	4.8 $\pm$ 2.6	.078

Values are expressed as mean  $\pm$  SD.

Group S, sevoflurane anesthesia group; Group P, propofol anesthesia group.

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