Patient quality of recovery on the day of surgery after propofol total intravenous anesthesia for vitrectomy
A randomized controlled trial
Se Hee Na, Kyu Hee Jeong, Dahae Eun, Jin Ha Park, Min-Soo Kim

Abstract
Background: Vitrectomy under general anesthesia is considered as a candidate for ambulatory surgery. An anesthetic method with high quality of postoperative recovery should be selected for successful ambulatory surgery. We thus compared quality of postoperative recovery on the day of vitrectomy using the Quality of Recovery (QoR)-40 questionnaire between propofol total intravenous anesthesia (propofol group) and desflurane inhalation anesthesia (desflurane group) as the 2 representative anesthetic methods.

Methods: Eighty-four patients (20–80 years old) undergoing elective vitrectomy under general anesthesia were randomized into 2 groups. The propofol group received propofol and remifentanil using effect-site target-controlled infusion (TCI), and the desflurane group received desflurane inhalation and remifentanil using effect-site TCI. We assessed quality of recovery at 6 hours after surgery through interviews using the QoR-40 questionnaire. We also collected data related to recovery and complications during emergence and recovery period.

Results: The median of QoR-40 score on the day of surgery was significantly higher in the propofol group than that in the desflurane group (181.0 vs 169.5, respectively; \( P = 0.033 \)). In particular, propofol group had significantly higher scores for physical comfort and physical independence dimensions. The amount of remifentanil administered was significantly higher, and the emergence time was significantly longer in propofol group. However, there were no significant differences in other complications between the 2 groups.

Conclusions: Propofol total intravenous anesthesia provided significantly better quality of recovery on the day of surgery than desflurane inhalation anesthesia.

Abbreviations: ASA = American Society of anesthesiologists, BIS = bispectral index, BMI = body mass index, EtCO₂ = end-tidal carbon dioxide, HR = heart rate, MAP = mean arterial pressure, NMDA = N-methyl-D-aspartae, NRS = numerical rating scale, PACU = postanesthesia care unit, POD = postoperative day, PONV = postoperative nausea and vomiting, QoR-40 = Quality of Recovery-40 questionnaire, TCI = target-controlled infusion, TIVA = total intravenous anesthesia.

Keywords: anesthesia, postoperative, quality measures, vitrectomy

1. Introduction

Various surgical procedures under general anesthesia are currently performed in the form of ambulatory surgery for the purpose of fast discharge with reduced costs and rapid return of daily activities.[1,2] For a successful ambulatory surgery, adequate recovery from anesthesia is important requirements of today’s anesthetics.[1]

As patients’ quality of life has recently become the primary endpoint in clinical researches, satisfactory recovery is being redefined as an improvement of overall quality of recovery, which includes the enhancement of comfort and prompt resumption of normal activities.[1,3–5] However, the patient quality of recovery may not be easily assessed with conventional recovery indices, that is, awakening time, duration of stay, or adverse events. Instead of these traditional approaches, the Quality of Recovery-40 (QoR-40) questionnaire has been widely used to assess the difference in quality of recovery depending on the type of anesthesia or the use of adjuvant agents.[1,5–9]

Several ophthalmic surgeries are commonly performed in an outpatient setting, so retina surgery such as vitrectomy is also considered as a candidate for ambulatory surgery.[6,7] However, vitrectomy may require general anesthesia because of long operation time and delicate manipulation.[8,9] Hence, it is
important to choose an anesthetic method with high quality of recovery to successfully perform retinal surgery under the general anesthesia as ambulatory surgery.

Two representative general anesthetic techniques are propofol total intravenous anesthesia (TIVA) and inhalation anesthesia. Lee et al reported that quality of recovery measured by QoR-40 on postoperative day 1 and 2 after thyroid surgery was superior with propofol TIVA compared with desflurane inhalation anesthesia. However, this study did not provide data on quality of recovery on the day of surgery, which may be of interest in terms of ambulatory surgery. We thus compared patient quality of recovery after propofol TIVA and desflurane inhalation anesthesia using the QoR-40 on the day of vitrectomy.

2. Methods

Institutional Review Board at Gangnam Severance Hospital (Seoul, Republic of Korea) approved this study protocol (3-2014-0104). This study was registered at www.ClinicalTrials.gov (ref. number: NCT02212340) and was performed at a single medical centre (Gangnam Severance Hospital), and written informed consent was obtained from all participants. The principles of the Declaration of Helsinki were followed throughout.

In all, 84 patients, 20–80 years of age, American Society of Anesthesiologists (ASA) class I–III, and presenting for elective vitrectomy under general anesthesia were included. Exclusion criteria were allergy to the anesthetic agents, anticipated difficult airway, body mass index (BMI) greater than 30, chronic obstructive pulmonary disease, heart failure, or unstable angina. Each patient was allocated to the propofol or desflurane group by a random-number list created without dividing blocks from a website (http://www.random.org). The enrolled patients, surgical personnel, postoperative outcome data investigator, ward nurses, and data analysts were masked to the group assignment. Because of different differences between the 2 anesthetic methods, attending anesthesiologists were aware of the group allocation.

The electrocardiogram, pulse oxygen saturation, noninvasive blood pressure, end-tidal carbon dioxide (EtCO₂), and the bispectral index (BIS; A-2000 BIS Monitor, Aspect Medical Systems Inc., Newton, MA) were monitored at regular intervals. In the propofol group, propofol and remifentanil were administered with a target-controlled infusion (TCI) system (Orchestra Base Primea, Fresenius Vial, Brezins, France) for anesthesia induction and maintenance. In the desflurane group, anesthetic induction was established with a bolus administration of propofol 1.5 to 2 mg/kg, and the anesthetized state was maintained with desflurane inhalation and remifentanil infusion through the TCI system. The effect-site concentrations of propofol and remifentanil infused through the TCI system were determined by Schnider and Minto pharmacokinetic models, respectively. Rocuronium 0.6 mg/kg was injected to facilitate orotracheal intubation during the induction period. After tracheal intubation, mechanical ventilation was initiated with a tidal volume of 8 mL/kg and respiratory rate was adjusted to maintain an EtCO₂ of 30 to 40 mm Hg with 50% oxygen/air mixture. The anesthetics administered in each group were adjusted to provide a BIS value of 40 to 60 and mean arterial pressure (MAP) within 20% of preinduction values. Hemodynamic instability during anesthesia was managed with intravenous phenylephrine or ephedrine depending on the judgement of the attending anesthesiologist.

Ramosetron 0.3 mg for prophylactic antiemesis and propacetamol 1 g for analgesia were intravenously administered 10 minutes before the end of the operation. Once the operation was completed, neostigmine 0.04 mg/kg and glycopyrrolate 0.005 mg/kg were given intravenously, and all the anesthetic agents were discontinued. When adequate response to verbal command and sufficient spontaneous respiration were observed, tracheal extubation was performed. Every patient was admitted to the postanesthesia care unit (PACU) after stable vital signs, and spontaneous breathing with airway patency were confirmed.

From the time of discontinuation of anesthetic agents, the durations to the first verbal command and extubation were recorded. The total amount of remifentanil and vasopressors administered during anesthesia, BIS value, and respiratory rate at the time of extubation were also recorded. To compare the amount of vasopressors administered to both groups, the amount of ephedrine was converted to the equivalent amount of phenylephrine by applying a relative potency ratio of 80:1 for phenylephrine/ephedrine. Emergence was defined as the time period from the discontinuation of anesthetic agents to 2 minutes after tracheal extubation. During emergence, the grade of agitation and cough was assessed using the Ricker sedation-agitation scale and a 4-point scale, respectively (Table 1). A sedation-agitation scale score ≥5 was considered as the presence of emergence agitation. A sedation-agitation scale score of 7 was regarded as dangerous agitation. Vital signs including MAP and heart rate (HR) were recorded before anesthesia induction, at 10 and 30 minutes after initiation of the operation, at the end of the operation, and at 1 and 2 minutes after tracheal extubation. In addition, BIS score at tracheal extubation and adverse events such as desaturation (SpO₂ <90%), airway obstruction, and laryngospasm were also recorded during emergence.

In the PACU, the scores on the sedation-agitation scale at the time of arrival, an 11-point numerical rating scale (NRS) for postoperative pain (0 = no pain and 10 = worst pain imaginable), and a 4-point nausea and vomiting score (0 = no nausea, 1 = mild nausea, 2 = severe nausea requiring antiemetics, and 3 = retching, vomiting, or both) were recorded. Residual sedation was defined as a sedation-agitation scale score ≤3 at the time of arrival. If NRS was 5 or greater, fentanyl 50 μg was administered intravenously. When the 4-point nausea and vomiting scale score was 2 or greater, metoclopramide 10 mg was administered intravenously. Discharge from the PACU was permited when the Aldrete score was 9 or more.

The quality of functional recovery at 6 hours after surgery was assessed through interviews using the QoR-40 questionnaire, which includes 5 dimensions of recovery: emotional state (9 items), physical comfort (12 items), physical independence (5 items), psychological support (7 items), and pain (7 items). Each item

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Ricker sedation-agitation scale and 4-point cough scale scores during emergence.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ricker sedation-agitation scale</td>
<td>Score</td>
</tr>
<tr>
<td>Minimal or no response to noxious stimuli</td>
<td>1</td>
</tr>
<tr>
<td>Arousal with physical stimuli but does not communicate</td>
<td>2</td>
</tr>
<tr>
<td>Difficult to arouse but awakens to verbal stimuli or gentle shaking</td>
<td>3</td>
</tr>
<tr>
<td>Calm and follows commands</td>
<td>4</td>
</tr>
<tr>
<td>Anxious or physically agitated and calms with verbal instructions</td>
<td>5</td>
</tr>
<tr>
<td>Requires restraint and frequent verbal reminders of limits</td>
<td>6</td>
</tr>
<tr>
<td>Pulling at tracheal tube, trying to remove catheters or striking at staff</td>
<td>7</td>
</tr>
<tr>
<td>4-point scale</td>
<td>Score</td>
</tr>
<tr>
<td>No cough</td>
<td>0</td>
</tr>
<tr>
<td>Single cough</td>
<td>1</td>
</tr>
<tr>
<td>Persistent cough lasting &lt;5 s</td>
<td>2</td>
</tr>
<tr>
<td>Persistent cough lasting ≥5 s or bucking</td>
<td>3</td>
</tr>
</tbody>
</table>
was assessed with a 5-point score. The total score on the QoR-40 questionnaire ranges from 40 (extremely poor) to 200 (excellent).

The primary endpoint of this study was the total QoR-40 score at 6 hours after surgery. The mean and standard deviation of the postoperative QoR-40 questionnaire from a previous study were respectively 167 and 23.[3] A sample size of 57 patients in each group was calculated to detect the difference of 15 points in the total QoR-40 score, under a of 0.05 and a power of 80%. Finally, 84 patients were included to allow for a dropout rate of 10%. Continuous variables were analyzed with an independent t test or Wilcoxon rank-sum test after Shapiro-Wilk normality testing. The chi-square test or Fisher exact test was used to compare categorical variables. A linear mixed model with repeated measures was applied to compare repeatedly measured variables including MAP and HR. If overall differences were confirmed among values at each time point, post hoc analysis for multiple comparisons was performed with the Bonferroni correction. A P value of <.05 was considered statistically significant.

3. Results
In all, 84 patients were enrolled in this investigation, and 84 were randomized, of whom 1 in the propofol group was withdrawn due to the refusal to respond to the QoR-40, leaving 83 patients for final analysis (Fig. 1). Patient characteristics were similar between the propofol and desflurane groups (Table 2). There were no significant differences in operative time, anesthesia time, or baseline vital signs between the 2 groups.

Table 3 presents QoR-40 scores for the propofol and desflurane groups on the day of surgery. Total score was significantly higher in the propofol group than in the desflurane groups (median value 181.0 vs 169.5, respectively; P = .033). The propofol group demonstrated significantly higher scores in physical comfort and physical independence (P = .031 and P = .045, respectively). Other dimensions did not show significant differences between the 2 groups.

Perioperative data are shown in Table 4. In the intraoperative period, the amount of remifentanil administered was significantly higher in the propofol group (P < .001). In the emergence period, the response time to verbal commands and extubation time was significantly longer in the propofol group (P < .001). In the PACU, agitation score, pain score, nausea/vomiting events, and the use of analgesics and antiemetics showed no significant differences.

The MAP and HR were not significantly different between the groups before anesthesia induction, at 10 and 30 minutes after

![Figure 1. Patients flow diagram.](https://www.md-journal.com)
initiation of the operation, and at the end of the operation. However, at 1 and 2 minutes after extubation, the desflurane group had a significantly higher HR than the propofol group (adjusted \( P < .05 \)) (Fig. 2).

4. Discussion
Our study showed a significant improvement in the patient’s perception of overall quality of recovery in those with propofol TIVA compared with those with desflurane anesthesia. In detail, propofol TIVA led to significant higher scores in physical comfort and physical independence dimensions of the QoR-40 on the day of surgery compared with desflurane anesthesia.

Regional anesthesia techniques are currently preferred in ophthalmic surgery due to advantages including lower cost, early hospital discharge with rapid recovery, and avoidance of general anesthesia with tracheal intubation.\[17–19\] Regional techniques may rarely be associated with serious adverse events, that is, globe perforation, bulbar hemorrhage, respiratory arrest, cardiovascular depression, and convulsion.\[20\] In addition, there are still several problems such as pain, fear and anxiety of patients, and unexpected eye movement during intraocular

### Table 2
Patient characteristics in the propofol and desflurane groups.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Propofol group (n=41)</th>
<th>Desflurane group (n=42)</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>59.0 (51.0–64.0)</td>
<td>60.0 (50.0–70.0)</td>
<td>.458</td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>17 (41.5)/24 (58.5)</td>
<td>19 (45.2)/23 (54.8)</td>
<td>.900</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>162.7 (8.7)</td>
<td>162.4 (10.0)</td>
<td>.908</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>64.1 (10.7)</td>
<td>63.9 (11.5)</td>
<td>.935</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>13 (31.7)</td>
<td>5 (11.9)</td>
<td>.055</td>
</tr>
<tr>
<td>Hypertension</td>
<td>12 (29.3)</td>
<td>15 (35.7)</td>
<td>.695</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>1 (2.4)</td>
<td>1 (2.4)</td>
<td>1.000</td>
</tr>
<tr>
<td>ASA class (I/II/III)</td>
<td>14 (34.1)/19 (46.3)/8 (19.5)</td>
<td>15 (35.7)/18 (42.9)/9 (21.4)</td>
<td>.947</td>
</tr>
<tr>
<td>Operation time (min)</td>
<td>60.0 (44.0–79.0)</td>
<td>62.0 (48.0–91.0)</td>
<td>.289</td>
</tr>
<tr>
<td>Anesthesia time (min)</td>
<td>100.0 (79.0–135.0)</td>
<td>110.0 (100.0–135.0)</td>
<td>.160</td>
</tr>
<tr>
<td>Baseline vital signs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean arterial pressure (mm Hg)</td>
<td>101.7 (18.0)</td>
<td>99.3 (14.9)</td>
<td>.509</td>
</tr>
<tr>
<td>Heart rate (beat/min)</td>
<td>71.0 (62.0–81.0)</td>
<td>72.0 (63.0–81.0)</td>
<td>.757</td>
</tr>
</tbody>
</table>

Data are presented as mean (SD), median (IQR), or n (%) as appropriate.
ASA = American Society of Anesthesiologists, IQR = interquartile range, SD = standard deviation.

### Table 3
QoR-40 scores for the propofol and desflurane groups on the day of surgery.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Propofol group (n=41)</th>
<th>Desflurane group (n=42)</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical comfort</td>
<td>54.0 (50.0–57.0)</td>
<td>49.5 (47.0–56.0)</td>
<td>.031</td>
</tr>
<tr>
<td>Emotional status</td>
<td>42.0 (40.0–44.0)</td>
<td>40.0 (35.0–43.0)</td>
<td>.072</td>
</tr>
<tr>
<td>Physical independence</td>
<td>23.0 (21.0–25.0)</td>
<td>21.0 (16.0–25.0)</td>
<td>.045</td>
</tr>
<tr>
<td>Psychological support</td>
<td>32.0 (27.0–33.5)</td>
<td>31.0 (27.0–34.0)</td>
<td>.395</td>
</tr>
<tr>
<td>Pain</td>
<td>31.0 (27.0–34.0)</td>
<td>29.5 (25.0–33.0)</td>
<td>.141</td>
</tr>
<tr>
<td>Total score</td>
<td>161.0 (163.0–191.0)</td>
<td>169.5 (155.0–184.0)</td>
<td>.033</td>
</tr>
</tbody>
</table>

Data are presented as mean (IQR). IQR = interquartile range, QoR-40 = 40-item Quality of Recovery questionnaire.

### Table 4
Perioperative data of the propofol and desflurane groups.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Propofol group (n=41)</th>
<th>Desflurane group (n=42)</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remifentanil dose (( \mu )g/kg/min)</td>
<td>0.066 (0.021)</td>
<td>0.049 (0.016)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Phenylephrine dose (( \mu )g/kg/min)</td>
<td>0.103 (0.133)</td>
<td>0.140 (0.129)</td>
<td>.201</td>
</tr>
<tr>
<td>Time to verbal response (s)</td>
<td>799.0 (665.0–975.0)</td>
<td>497.5 (400.0–622.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Time to extubation (s)</td>
<td>867.0 (700.0–1072.0)</td>
<td>523.0 (440.0–635.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>BIS score at extubation</td>
<td>77 (75–78)</td>
<td>82 (75–86)</td>
<td>.027</td>
</tr>
<tr>
<td>Agitation score during emergence</td>
<td>0 (0)/4 (9.8)/5 (12.2)/28 (68.3)/4 (9.8)/0 (0)/0 (0)</td>
<td>0 (0)/0 (0)/4 (9.5)/27 (64.3)/10 (23.8)/1 (2.4)/0 (0)</td>
<td>.104</td>
</tr>
<tr>
<td>Incidence of emergence agitation</td>
<td>4 (9.8)%</td>
<td>11 (26.2)%</td>
<td>.097</td>
</tr>
<tr>
<td>Cough score during emergence</td>
<td>18 (43.9)/13 (31.7)/7 (17.1)/3 (7.3)</td>
<td>15 (35.7)/13 (31.0)/11 (26.2)/3 (7.1)</td>
<td>.765</td>
</tr>
<tr>
<td>Desaturation events during emergence</td>
<td>0 (0)</td>
<td>1 (2.4)</td>
<td>&gt;.999</td>
</tr>
<tr>
<td>Airway obstruction during emergence</td>
<td>0 (0)</td>
<td>1 (2.4)</td>
<td>&gt;.999</td>
</tr>
<tr>
<td>PACU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agitation score on arrival (1/2/3/4/5/6/7)</td>
<td>0 (0)/0 (0/2 (4.9)/39 (95.1)/0 (0)/0 (0)</td>
<td>0 (0)/0 (0/1 (2.4)/39 (92.2)/2 (4.8)/0 (0)</td>
<td>.313</td>
</tr>
<tr>
<td>Maximum pain score</td>
<td>4.0 (2.0–4.0)</td>
<td>4.0 (3.0–4.0)</td>
<td>.943</td>
</tr>
<tr>
<td>Maximum nausea/vomiting score</td>
<td>41 (100%)/0 (0)/0 (0)</td>
<td>41 (97.6%)/0 (0)/1 (2.4%)/0 (0)</td>
<td>&gt;.999</td>
</tr>
<tr>
<td>Use of analgesic</td>
<td>2 (4.9%)</td>
<td>2 (4.8%)</td>
<td>&gt;.999</td>
</tr>
<tr>
<td>Use of antiemetic</td>
<td>0 (0.0%)</td>
<td>1 (2.4%)</td>
<td>&gt;.999</td>
</tr>
<tr>
<td>PACU time</td>
<td>40.0 (34.0–53.0)</td>
<td>39.5 (32.0–55.0)</td>
<td>.942</td>
</tr>
</tbody>
</table>

Data are presented as mean (SD), median (IQR), or n (%) as appropriate.
BIS = bispectral index, IQR = interquartile range, PACU = postanesthesia care unit, SD = standard deviation.
Postoperative systemic adverse events after vitrectomy.[21] Thus, greater comorbidities such as renal disease and coronary artery addition, patients undergoing vitreoretinal surgery may have disorientation, and cardiovascular and respiratory depression drugs have several adverse effects including noncooperation, previous studies have compared propofol TIVA and inhalation activities.[3,4] However, conventional fragmentary indices regarding recovery and complications from general anesthesia have limitations in evaluating patient quality of recovery.[3,4] These results confirm the superiority of propofol TIVA over the quality of recovery during overall postoperative recovery period, but it is difficult to confirm the quality of recovery immediately after surgery, which may be an important issue in ambulatory surgery. From our results, QoR-40 on the day of surgery was also improved in propofol TIVA compared with desflurane anesthesia. Therefore, the use of propofol TIVA is expected to contribute to the improvement of functional recovery after general anesthesia not only in surgery under admission but also in ambulatory surgery.

From our study, propofol TIVA showed significant higher scores in physical comfort and physical independence dimensions of the QoR-40 on the day of surgery compared with desflurane anesthesia. These results were consistent with the results from Lee et al.[41] study. The physical comfort is composed of questions related to alleviation of short-term effects (eg, breathing, sleep, eating, resting, nausea, vomiting, dry retching, restlessness, and dizziness) after anesthesia and surgery. Hence, this domain may provide information regarding side effects and problems inherent in patients with ambulatory surgery.[42,24] Previous studies have demonstrated that TIVA decreases postoperative nausea and vomiting (PONV) compared with inhalation anesthesia.[25,26] Lee et al.’s study also showed lower incidence of PONV on POD1 in TIVA.[44] Therefore, less PONV in patients with TIVA may have improved their physical comfort compared with using inhalation anesthesia. The physical independence mainly reflects the ability to conduct daily physical activities such as writing, working, speech, communication, and washing, which is related with rapid resumption of normal activities.[3,4] Although the greater use of remifentanil and delayed awakening time were observed in our study, TIVA provided better quality of recovery on the day of surgery. Based on these results, we could assume that rapid recovery of consciousness or respiration immediately after anesthesia does not necessarily guarantee good quality of recovery.

Studies have demonstrated that preoperative dexamethasone improves quality of recovery.[27,28] These results suggest that quality of recovery may be related to the modulation of inflammatory and stress response, which were stimulated by surgical trauma and anesthesia.[14,29] Propofol may inhibit pro-inflammatory cytokine including interleukin (IL)-6, IL-1β, and tumor necrosis factor (TNF)-α, and enhance anti-inflammatory cytokine and free radical scavenging.[30,31] In addition, the
increase of serum glucose level induced by perioperative stress
was attenuated in TIVA, compared with inhalation anesthesi-
a. Therefore, propofol TIVA might provide better quality of
recovery by modulating the perioperative stress and inflam-
ma

Some previous studies have shown that TIVA provided better
postoperative analgesia compared to inhalation anesthesi-
a. In vivo studies have found that propofol may 
modulate N-methyl-D-aspartate (NMDA) receptor, which plays an important role in pain signaling pathway.

However, the present study did not show significant differences in postop-
ervine scores and pain dimension of QoR-40 between TIVA
and desflurane anesthesia. Lee et al's study also reported no
difference in pain dimension between the 2 anesthetic methods.
Recent retrospective case-controlled study did not prove
superiority of propofol in terms of postoperative pain. The
effect of propofol on postoperative analgesia should be further
elicited through further studies.

There are some limitations or considerations to this study. First,
the preoperative QoR-40 was not evaluated in this study.
However, there was no difference in demographic data among
the preoperative QoR-40 was not evaluated in this study.

5. Conclusions
In conclusion, propofol TIVA showed the improved quality of
recovery on the day of surgery than desflurane anesthesia.
For vitrectomy under ambulatory setting, propofol
TIVA should be preferentially considered as a general anesthetic
method to facilitate patients' rapid resumption of normal activity.

Given the limited external generalization of our results, further
research is required to determine whether propofol improves the
quality of recovery in other types of ambulatory surgery.

Acknowledgments
This study was presented, in part, as an abstract at 93rd Korean
Society of Anesthesiologist Annual Meeting, Incheon, November
3–5, 2016.

Author contributions
Conceptualization: Jin Ha Park, Min-Soo Kim.
Data curation: Se Hee Na, Kyu Hee Jeong, Jin Ha Park, Min-Soo Kim.

Formal analysis: Kyu Hee Jeong, Dahae Eum, Min-Soo Kim.

Investigation: Se Hee Na, Jin Ha Park, Min-Soo Kim.
Supervision: Jin Ha Park, Min-Soo Kim.

Writing – original draft: Se Hee Na, Kyu Hee Jeong, Dahae Eum, Jin Ha Park, Min-Soo Kim.
Writing – review & editing: Jin Ha Park, Min-Soo Kim.

References
postoperative quality of recovery score: the QoR-40. Br J Anaesth
2000;85:11–5.
quality of recovery: a randomized trial comparing propofol-remifentanil
total i.v. anesthesia with desflurane anesthesia. Br J Anaesth
measurement of postoperative quality of recovery. Anaesthesia
2014;69:1266–78.
and the acceptability of outpatient retinal detachment surgery. J Fr
undergoing pars plana vitrectomy surgery. Cochrane Database Syst Rev
2016;2:CD009936.
surgery under local anesthetic block with sedation: a single surgeon,
single anaesthetist review. Eye (Lond) 2017;31:1115–6.
the pharmacokinetics and pharmacodynamics of remifentanil. I. Model
and phentylephrine in the prevention of post-spinal hypotension in
tomidine infusion on emergence agitation and quality of recovery after
[15] Rieder RR, Picard JT, Fraser GL. Prospective evaluation of the Sedation-
Agitation Scale for adult critically ill patients. Crit Care Med
administered at the end of anesthesia for prevention of emergence
agitation after sevoflurane anesthesia in children. Br J Anaesth
masked comparison of local anaesthetic agents for vitrectomy. Br J
elderly patients undergoing intracocular surgery. Br J Ophtalmol
patient and surgeon satisfaction during retinal surgery under sub-tenon’s
anesthesia: a randomized controlled trial. Korean J Anesthesiol
seizures and transient contralateral hemiparesis following retrobulbar
psychometric testing of a quality of recovery score after general
sevoflurane/remifentanil for long lasting surgical procedures: a random-
Bost JE, Williams BA, Bottegal MT, et al. The 8-item Short-Form Health Survey and the physical comfort composite score of the quality of recovery 40-item scale provide the most responsive assessments of pain, physical function, and mental function during the first 4 days after ambulatory knee surgery with regional anesthesia. Anesth Analg 2007;105:1693–700.


