Patient-controlled propofol sedation for elderly patients: safety and patient attitude toward control

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Purpose: Little information is available regarding the use of patient-controlled sedation (PCS) among elderly patients undergoing operative procedures under local or regional anaesthesia. This prospective, randomized study evaluated the safety of propofol PCS, and the attitude among elderly patients toward self-administration of sedation during cataract surgery.

Methods: Prospective, randomized study conducted in a University affiliated, tertiary-care hospital. Fifty-five elderly patients (aged 65–79 yr) were randomized to receive propofol patient-controlled sedation (PCS) ($n = 28$) or no intraoperative sedation ($n = 27$) during cataract surgery performed under peribulbar block. The PCS parameters consisted of a lockout interval of three minutes and a PCS dose of $0.3 \text{ mg} \cdot \text{kg}^{-1}$. Study groups were compared with respect to sedation, anxiety and discomfort visual analogue scores (VAS), cognitive functioning, patient satisfaction and the incidence of intraoperative complications.

Results: Patients in the PCS group administered a mean propofol dose of $65 \pm 49 \text{ mg}$ during procedures with a mean duration of 46 min. The incidence of intraoperative complica-

tions and sedation, anxiety and discomfort VAS were similar between groups. Patient satisfaction with PCS was high. In the PCS group, 10 (35%) of the 28 patients did not use the device because they were comfortable and did not feel they needed sedation. Satisfaction was higher in the PCS group ($P = 0.02$), whether or not they used the PCS device, compared with patients who did not receive a PCS device.

Conclusions: Propofol PCS represents a safe sedation technique among elderly patients in a monitored care setting. Elderly patients appear to prefer the option of receiving some form of intraoperative sedation and respond favourably to the opportunity to control administration.

Objectif: On ne connaît peu sur la pratique de la sédation autocontrôlée (PCS) chez les patients âgés subissant des interventions sous anesthésie locale ou régionale. Cette étude aléatoire prospective évaluait la sécurité du propofol en PCS et l'attitude d'une population âgée vis-à-vis l'autoadministration de la sédation pendant une intervention pour cataracte.

Méthodes: Étude prospective aléatoire menée dans un hôpital de soins tertiaires affilié à une université. Cinquante-cinq patients âgés (65–79 ans) étaient répartis aléatoirement pour recevoir une sédation autocontrôlée (PCS) ($n = 28$) ou aucune sédation ($n = 27$) pendant une intervention pour cataracte réalisée sous bloc péribulbaire. L'appareil de PCS était réglé pour un intervalle de sécurité de trois minutes et une dose PCS de $0,3 \text{ mg} \cdot \text{kg}^{-1}$. Les groupes d'étude étaient comparés sous l'aspect de la sédation, de l'anxiété, de l'inconfort sur une échelle visuelle analogique (ÉVA), de la fonction cognitive, de la satisfaction du patient et de l'incidence des complications peropératoires.

Résultats: Les patients du groupe PCS se sont administrés une dose moyenne de propofol de $65 \pm 49 \text{ mg}$ pendant l'intervention dont la durée moyenne était de 46 min. L'incidence des complications peropératoires, la sédation, l'anxiété et les scores EVA d'inconfort étaient les mêmes pour les deux groupes. La satisfaction des patients sous PCS était élevée. Dans le groupe PCS, dix (35%) des 28 patients n'ont pas utilisé l'appareil parce qu'ils se sentaient confortables et n'avaient pas besoins de sédation. La satisfaction était plus

Key words

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élevée dans le groupe PCS ($P = 0,02$), qu'ils aient ou non utilisé l'appareil de PCS, comparativement aux patients qui n'avaient pas accès à un appareil de PCS.

Conclusion: La PCS au propofol représente une technique sécuritaire de sédation pour les patients âgés opérés sous surveillance. Les patients âgés semblent préférer une forme de sédation peropératoire et répondent favorablement à l'opportunité d'en contrôler l'administration.

Numerous studies have reported the use of patient-controlled sedation (PCS) during a variety of procedures performed using local or regional anaesthesia.¹⁻⁵ The advantages cited in favour of PCS generally parallel advantages cited for patient-controlled analgesia (PCA) for postoperative pain. These include efficacy (patients are able to titrate sedation to their individual needs), safety (patient-administration provides a mechanism to compensate for individual pharmacokinetic and pharmacodynamic differences) and high satisfaction (many patients appear to enjoy the sense of control or autonomy associated with self-administration).

Reports of patient-controlled drug administration have typically involved patients in younger age groups. Elderly patients being more susceptible to drug-induced complications (e.g., ventilatory depression, confusion) have traditionally been excluded from studies involving patient-controlled drug administration. However, many of the advantages of patient-controlled drug administration would be potentially beneficial in this population. Theoretically, self-administration should allow safe and effective titration of medications. Unpredictable pharmacokinetic and pharmacodynamic changes associated with aging, which typically complicate predictions regarding appropriate dosing, would potentially be nullified by self-administration. In this respect, experience at our hospital using PCA for postoperative analgesia among elderly patients has generally been favourable.⁶

Little information is available regarding the perspective of elderly patients toward the provision of intraoperative sedation during procedures performed under regional or local anaesthesia. Cataract surgery is typically performed at our hospital under regional anaesthesia and patients rarely receive intraoperative sedation, although the procedure is conducted in a monitored care setting. These circumstances provided the opportunity to evaluate the safety of propofol PCS among the elderly and to assess the attitude toward self-administration of sedation among elderly patients.

Methods

Following approval of the institutional ethics review board and acquisition of written informed consent,

elderly patients (65–79 yr) scheduled to undergo elective cataract extraction were randomized to receive propofol PCS or no intraoperative sedation. The PCS parameters consisted of a propofol PCS dose of 0.3 mg·kg⁻¹ and a lockout interval of three minutes. Basal infusions were not used. Patients randomized to PCS received instructions preoperatively to ensure they understood how to use the device.

All patients received supplemental oxygen via nasal prongs. Intraoperative monitoring included ECG, automatic noninvasive blood pressure and continuous pulse oximetry. Respiratory rate was monitored via capnographic sampling from the nasal prongs. Peribulbar blocks were performed by the attending surgeon or anaesthetist using a mixture of xylocaine 2%, bupivacaine 0.5% and hyaluronidase. Two sites were injected with a total volume of 6–8 ml of the local anaesthetic mixture and ocular compression, using a Honan balloon at 30 mmHg, was carried out for five minutes.

Each study was supervised by an independent research nurse who conducted cognitive function testing, obtained visual analogue scores (VAS) for discomfort, sedation, anxiety and patient satisfaction, recorded drug use and noted complications. Cognitive functioning was evaluated preoperatively and one-hour after completion of the procedure using an abbreviated version of the Mini Mental Status Examination (MMSE). The MMSE has been endorsed⁷ as a useful screening test for cognitive impairment in the elderly and the abbreviated version has been reported to contain the MMSE test items with the highest specificity and sensitivity for cognitive impairment.^{8,9}

Discomfort, sedation and anxiety VAS were obtained preoperatively (PREOP), immediately at the end of surgery (EOS) and one-hour following arrival in the postanesthetic care unit (PACU). Each visual analogue scale consisted of a 200 mm long, horizontal, solid black line demarcated at each end with a short vertical bar and printed on an 8.5" by 11" card. The ends of each line were marked, in large type, to denote the worst or greatest (as appropriate) aspect of each index and the absence of each index respectively. The VAS for each index were recorded as a vertical line drawn by the patient at the appropriate point along each scale. Each VAS were standardized to 100mm.

Patient satisfaction was assessed by satisfaction VAS and a brief questionnaire (Appendix A) completed by each patient in the PACU. Complications were noted including haemodynamic instability (systolic BP >180 or <85 mmHg; heart rate >110 or <50 bpm), ventilatory depression (<8 breaths per minute), pulse oximetric desaturation (<90%), excessive sedation or restlessness.

The VAS scores were expressed as absolute change

TABLE I Demographic data

Parameter	Propofol PCS	No sedation
Age (yr)	73.9 ± 3.6	72.1 ± 3.7
Sex (M:F)	8:20	12:15
Weight (kg)	68.4 ± 12.2	72.8 ± 12.3
ASA Physical Status	2.1 ± 0.6	2.2 ± 0.7
Duration of procedure (min)	52.8 ± 16.9	45.9 ± 12.7

Mean ± SD. PCS = patient-controlled sedation.

TABLE II Study results

Parameter	Propofol PCS	No sedation
Total propofol dose (mg) (patients who used PCS)	64.6 ± 49.0	N/A
PCS Demand ration (%) (successful:total demands)	50	N/A
MMSE scores (maximum 15)		
– Preop	12.8 ± 1.8	13.5 ± 1.7
– PACU	13.6 ± 2.0	13.8 ± 1.4
Satisfaction (scale 1–4)		
– Comfort	3.8 ± 0.6*	3.4 ± 0.6
– Repeat	3.7 ± 0.5	3.4 ± 0.8
– Self-control	3.7 ± 0.5	N/A
↑ BP (> 180 mmHg)	0	3
↓ BP (< 85 mmHg)	1	1
Ventilatory depression (<8)	1	0
Excess sedation	1	0

*Denotes difference between groups at $P \leq 0.05$.

Mean ± SD.

PCS: patient-controlled sedation; MMSE: abbreviated Mini Mental Status Exam; PACU: postanesthetic care unit; Comfort: satisfaction with general level of comfort during procedure; Repeat: willingness to repeat procedure using same sedation technique; Self-Control: satisfaction with self-administration (only PCS patients).

from preoperative score. Data were analyzed using Fisher's exact test and Student's *t* test for unpaired data. A level of $P \leq 0.05$ was accepted as statistically significant.

Results

Fifty-five elderly patients (mean age = 73 yr, range = 65–79 yr) were randomized to receive propofol PCS ($n = 28$) or no sedation ($n = 27$). All patients completed the surgical procedure satisfactorily. Demographic comparisons were similar between the two groups (Table I). Among the 28 patients who received a PCS device, 18 used PCS and 10 (35%) did not administer any sedation. Demographic comparisons were also similar between these two groups.

The mean propofol dose administered during PCS was 64.6 ± 49.0 mg. The ratio of successful to total PCS demands was 0.5. Cognitive function was well preserved in both groups (Table II). Discomfort, sedation and anxiety VAS were not different between groups.

FIGURE Visual analogue scores (VAS) for satisfaction among patients who did not receive a PCS device (open bar), those who used PCS propofol (cross-hatched bar) and those who received PCS but did not use it (vertical-hatched bar). Asterisks denote $P \leq 0.05$ for both PCS groups compared with the group that did not receive a PCS device. Error bars denote SEM.

The incidence of complications was similar between the groups (Table II). None of the patients experienced ocular complications. More patients in the "No PCS" group experienced increases in systolic blood pressure in excess of 180 mmHg but the difference was not statistically significant. One patient in the propofol PCS group experienced a transient episode of apnea and excessive sedation following the self-administration of two doses of propofol three-minutes apart in response to discomfort associated with an incomplete block. The patient was stimulated, spontaneous ventilation commenced and the procedure was completed without further incident following reinforcement of the block by sub-tenon injection of local anaesthetic.

Based on the satisfaction questionnaire results, patients in the propofol PCS group expressed greater satisfaction with the general level of comfort ($P = 0.01$) (Table II). Willingness to undergo a repeat procedure using the same technique did not differ between groups. Patient satisfaction with PCS was high. Satisfaction VAS was higher among the patients who received propofol PCS than in those who did not receive PCS ($P = 0.02$) (Figure). Satisfaction VAS was similar in the group who used PCS and in those who received but did not use PCS. In contrast, both PCS groups had higher

satisfaction VAS than the group who did not receive a PCS device.

Discussion

The results of this study demonstrate that propofol PCS can be used safely in elderly patients. The incidence of complications and the impact of propofol PCS on cognitive function did not differ compared with patients who did not receive PCS intraoperatively. One patient in the PCS group briefly developed ventilatory depression and excessive sedation using the device in response to an incomplete regional block. While the incidence of these complications did not differ between groups, the occurrence underscores the advantage of using PCS in a monitored care setting.

Grattidge² has noted deeper levels of sedation among older patients associated with a propofol PCS dose of $0.7 \text{ mg} \cdot \text{kg}^{-1}$ (mean age – 42 yr, range 26–72 yr) and has emphasized the need to reduce the PCS dose with advancing age. In our study, a PCS dose of $0.3 \text{ mg} \cdot \text{kg}^{-1}$ was found to be satisfactory among patients ranging in age from 65–79 yr.

Patient satisfaction was high with both techniques suggesting that, for these procedures, many patients are reasonably satisfied even in the absence of intraoperative sedation. However, satisfaction was higher among patients who received a PCS device, whether or not they chose to use it, than in patients who did not receive PCS. The patients who did not use the PCS device unanimously indicated that they had been comfortable and did not feel they needed intraoperative sedation. Each patient expressed satisfaction with the option of having the PCS device available and indicated that they would have used it had they needed sedation. These findings suggest that many elderly patients, given the option, prefer to know that some form of intraoperative sedation is available if they desire it.

This study did not include a group of patients who received anaesthetist-administered sedation so an index of patient satisfaction in this context is not available for comparison. While it is likely that patient satisfaction with sedation administered by an anaesthetist is comparable, the results of this study suggest that PCS offers a convenient alternative method of providing elderly patients with the option of obtaining intraoperative sedation.

Consistent with reports of PCS in younger patients,^{3,4} our data suggest that, in the elderly, the sense of control provided by PCS also contributes to the sense of satisfaction associated with this technique. Patients who did not use the PCS device expressed higher satisfaction than did patients who did not receive a PCS device, even though both groups received no intraoperative sedation.

The dose of propofol administered during PCS was relatively small (generally $<1 \text{ mg} \cdot \text{kg}^{-1}$ during procedures with an average duration of less than one-hour). However, the standard deviation for the PCS dose was large suggesting that there was some variation in dose requirement among these patients. These results, combined with high satisfaction scores even among patients who did not use the PCS device, suggest that elderly patients are able to titrate effectively their use of PCS to their individual needs.

In this study the successful:total demand ratio was 50%. Consistent with the results of other investigators,³ the seemingly low ratio of successful to total PCS demands does not appear to affect patient satisfaction with the technique adversely.

Our results show that propofol PCS can be used safely in elderly patients. Although PCS is probably not appropriate for all elderly patients, particularly those with preexisting cognitive impairment, the results of this study demonstrate that many elderly patients do appear to enjoy the option of controlling their own sedation.

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Appendix A

Patient Satisfaction Questionnaire

Please help us evaluate your anaesthetic by completing the following questions. We are interested in your honest opinion, positive or negative. We also welcome your comments and suggestions.

Circle your answer:

- 1 How satisfied were you with your pain management and overall level of comfort?
 - 4 Very satisfied
 - 3 Mostly satisfied or indifferent
 - 2 Mildly satisfied.
 - 1 Quite satisfied, dissatisfied.
- 2 If you were to have surgery again would you opt for the same method of management?
 - 1 No. Definitely not
 - 2 No. I don't think so
 - 3 Yes. I think so
 - 4 Yes. Definitely

3 Did you like the method of self-administration of sedative medication?

4 Yes. Definitely

3 Yes. I think so

2 No. I don't think so

1 No. Definitely not

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