Comparison the effect on cerebral oxygenation by sevoflurane-remifentanil or propofol-remifentanil anesthesia in patients undergoing carotid endarterectomy

Soengtae Jeong, Sung-Su Chung, Jeongmin Kim, En-A Jang, Hyung-Jeong Lee

Department of Anesthesiology and Pain Medicine, Medical School, Chonnam National University, Gwangju, Korea

INTRODUCTION

- Carotid endarterectomy (CEA)
 - ✓ Surgical treatment of carotid artery stenosis
 - ✓ Cerebral hypoperfusion after carotid artery clamping
 - ✓ Cerebral hyperperfusion syndrome after declamping (rare)
- Regional cerebral oxygen saturation (SrO₂)
 - ✓ Balance of oxygen supply and demand of brain tissue
 - ✓ Near-infrared spectroscopy (NIRS)
 - non-invasive tool to monitor the balance of cerebral oxygenation continuously
- Sevoflurane vs. Propofol
 - ✓ Both agents decrease the CMRO₂ in a similar manner
 - ✓ CMRO₂ ↓ → CBF ↓
 - ✓ Sevoflurane
 - ✓ Vasodilation effect → CBF ↑
 - ✓ CBF > cerebral oxygen demand (luxury perfusion)
 - ✓ Propofol
 - ✓ Vasoconstriction effect → CBF ↓
 - ✓ CMRO₂ ↓ < CBF ↓ (CBF/ CMRO₂ ratio ↓)
- ✓ The aim of study
 - ✓ compare the effects of sevoflurane and propofol to SrO₂ in the patients scheduled CEA to treat the defect of cerebral blood flow.

MATERIALS & METHODS

- Patients & experimental group
 - ✓ 74 patients aged 19–80 year, scheduled to undergo carotid endarterectomy under general anesthesia
 - ✓ Randomly allocated to Sevoflurane or Propofol group
 - ✓ Exclusion criteria
 - ASA physical status > 4,
 - Preoperative SpO₂ < 97%,
 - Both carotid arteries stenosis
 - Co-existing other neurological disease
- Anesthesia
 - ✓ Premedication: triazolam 0.125 mg p.o
 - ✓ Remifentanil 3 ng/ml using target controlled infuser (TCI)
 - ✓ Sevoflurane or propofol TCI: BIS 40 ~ 50
 - ✓ Rocuronium 0.6 mg/kg + continuous infusion (8 µg/kg/min)
 - ✓ Mechanical ventilation: PaCO₂ 35 ~ 40 mmHg
 - ✓ MAP < 55 mmHg or 25% of baseline, SBP < 90 mmHg
 - Phenylephrine 100 µg iv
 - Dopamine infusion: if hypotension sustained

RESULTS

Table 1. Demographic and Intraoperative Variables

	Sevoflurane (n = 36)	Propofol (n = 33)	P value
Sex (Male/Female)	31/5	27/6	0.562
Age	69 ± 8	67 ± 7	0.212
Height (cm)	163 ± 7	164 ± 7	0.322
Weight(kg)	64 ± 10	66 ± 10	0.513
Hemoglobin (g/dl)	12 ± 1	13 ± 1	0.273
Underlying diseases			
Hypertension	30	24	0.413
DM	13	15	0.389
Total anesthesia time	181 ± 29	174 ± 26	0.914
Total operation time	161 ± 19	158 ± 17	0.806
Artery clamping time	39 ± 8	38 ± 10	0.401
Fluid administered (ml)			
Crystalloid	1412 ± 377	1618 ± 441	0.069
Colloid	338 ± 218	256 ± 237	0.201
Bleeding (ml)	90 ± 42	116 ± 72	0.159
Urine (ml)	577 ± 279	762 ± 400	0.109

Values are mean ± SD or numbers.

Table 3. SrO₂ Values in before arterial clamping

	Sevoflurane (n = 36)	Propofol (n = 33)	P-value
Ipsilateral			
Mean SrO ₂ (%)	63.9 ± 6.6	65.3 ± 6.4	0.452
Minimum SrO ₂ (%)	61.8 ± 6.6	63.1 ± 7.1	0.407
Mean value of relative changes in SrO ₂ compare to baseline (%)	1.3 ± 8.0	-1.6 ± 8.0	0.237
Relative maximum decrease in SrO ₂ (%) compare to baseline	3.3 ± 8.8	4.8 ± 9.7	0.504
compare to post-induction	9.9 ± 6.2	8.1 ± 6.2	0.250
Contralateral			
Mean SrO ₂ (%)	67.1 ± 7.5	67.3 ± 6.9	0.452
Minimum SrO ₂ (%)	66.3 ± 8.0	66.3 ± 7.1	0.992
Mean value of relative changes in SrO ₂ compare to baseline (%)	9.1 ± 20	-1.9 ± 22	0.033
Relative maximum decrease in SrO ₂ (%) compare to baseline	-3.9 ± 10.1	0.7 ± 10.5	0.067
compare to post-induction	4.4 ± 3.7	6.6 ± 5.1	0.038

Values are mean ± SD.

SrO₂ = regional cerebral oxygen saturation.

CONCLUSION

- Propofol-remifentanil anesthesia was comparable with sevoflurane-remifentanil anesthesia undergoing carotid endarterectomy in an aspect of preserving the SrO₂, with less decrease in mean arterial blood pressure.