Incidence of Postoperative Cognitive Dysfunction Following Desflurane or Sevoflurane General Anesthesia in Elderly Patients: a Randomized Controlled Trial.

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Background

With increasing life expectancy, more patients >65 years old are receiving general anesthesia. It is estimated that 16% of the more developed nations is aged over 65, and in 2025, it is projected that 21% of the industrialized population will be over 65. Postoperative cognitive dysfunction (POCD) is a serious problem that affects the elderly. POCD can occur after general anesthesia, with an apparent contribution from anesthetic agents. Previous studies have shown desflurane (D) to have shorter emergence times compared to sevoflurane (S), but similar POCD effects. However, some prior studies dosed the inhalational agent by the use of age-adjusted estimations of minimum alveolar concentrations, rather than maintaining cerebral suppression in the moderately anesthetized range. This study was designed to investigate POCD differences between D and S in elderly patients in whom cerebral suppression is maintained in a moderate range.

Methods

IRB approved, prospective randomized trial (NCT01199913). Consenting patients >65, scheduled for elective surgery expected 120 minute duration, requiring general anesthesia with expected endotracheal intubation, at Loma Linda University Medical Center, were randomly assigned to D or S anesthesia. None of the study patients received preoperative sedation. Mini-Mental Status Examination (MMSE) was chosen as the screening test to quantitatively assess cognitive impairment and was given at baseline before the anesthetic then at 1, 6, and 24 hours after the end of anesthesia by the same investigator who was blinded to the patient's assigned study group. Mean arterial pressure was maintained ±20% of patient's baseline. The inhaled anesthetic agent was adjusted to maintain Patient State Index (PSI; SEDLine, Masimo, Irvine, CA) between 40- 50 as moderate general anesthesia.

Results

56 patients enrolled, with 11 excluded: change in surgery plan (5); anesthesiologist switched from D to S for airway concern (2); and 1 each for abnormal baseline MMSE; withdrew consent; PSI malfunction and morphine given in OR. Results from 45 patients are shown in Table 1. There were no intergroup differences in individual or perioperative factors. PSI was between 40-50 for >80% of measures from surgical incision to closure. MMSE scores were similar between groups at all measured times. The 1-hour post anesthesia MMSE score was lower than baseline in all patients, but the difference between S and D was not statistically significant. Patients' MMSE scores returned to baseline at 6 or 24 hours after anesthesia.

Discussion

A previous study used age adjusted MAC in a comparison of POCD after S and D.4 We used PSI as monitoring cerebral suppression may be a more specific and individualized method of adjusting inhaled anesthetic dose in the elderly. While both S and D were associated with lower MMSE at 1 hour, by 6 hours MMSE scores had returned to baseline. This implies that for elderly patients in whom depth of anesthesia is maintained in the moderate range (PSI 40 to 50), both S

and D are associated with mild but transient decreases in mental state after anesthesia, with minimal differences between S and D in this clinical setting.

Table: Patient Characteristics and Study Results

	Sevoflurane (n = 26)	Desflurane (n = 20)	p value
Age	71.0 ± 4.4	73.6 ± 4.9	0.07
Sex (male; female)	8; 18	8; 11	0.43
Body Mass Index (kg/m^2)	26.9 ± 2.9	25.8 ± 3.0	0.25
ASA (II; III; IV)	11; 14; 1	6; 13; 0	0.42
P-POSSUM physiological score	20.4 ± 5.0	20.5 ± 4.7	0.95
P-POSSUM operative severity	8.0 ± 1.6	8.0 ± 1.4	0.93
P-POSSUM mortality %	2.2 ± 2.2	2.0 ± 1.7	0.70
Surgical time (min)	136.7 ± 67.8	108.8 ± 52.4	0.10
Anesthesia time (min)	162 ± 70.0	136.3 ± 54.6	0.16
Emergence time (min)*	10.6 ± 6.8	7.3 ± 3.5	0.04
Extubation time (min)	10.3 ± 7.0	7.5 ± 3.5	0.08
PACU time (min)	108.1 ± 27.3	103.6 ± 22.5	0.55
Operative morphine equivalent use (mg)	22.5 ± 10.6	20.0 ± 7.8	0.37
PACU morphine equivalent use (mg)	9.3 ± 6.6	7.8 ± 7.3	0.48
Inpatient floor morphine equivalent use (mg)	24.8 ± 25.9	24.2 ± 34.8	0.95
Length of hospital stay (days)	1.6 ± 1.2	1.5 ± 0.9	0.69
MMSE Scores			
Preoperative	28.8 ± 1.3	28.6 ± 1.3	0.57
1 hour post anesthesia**	26.3 ± 2.9	26.8 ± 2.2	0.45
6 hours post anesthesia	28.9 ± 1.3	28.5 ± 1.7	0.34
24 hours post anesthesia	28.4 ± 1.7	28.0 ± 1.7	0.44

Intergroup comparisons: * S longer than D; p = 0.04
MMSE scores: No intergroup difference in MMSE scores at any time point.
**MMSE scores were lower at 1-hour compared to preoperative 6-hour and 24-hour scores ($p < 0.001$)