The end-tidal desflurane concentration for maintaining bispectral index below 50 in adult patients

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Introduction

- We often use bispectral index (BIS) as an index of depth of sedation.
- A BIS target below 50 is considered to be appropriate for unconsciousness during general anaesthesia in adult patients.
- Desflurane has rapid onset and offset, and is widely used for general anaesthesia.
- We examined the minimum alveolar concentration required to maintain BIS below 50 (MAC_{BIS50}) of desflurane using a protocol that had small step size of end-tidal desflurane concentration and excluded drugs that could affect BIS value.

Methods

- Institutional review board approval and written informed consent were obtained.
- Eighty-four patients, ASA physical status I and II, aged 10 to 89 years, who were scheduled for elective surgery under general anaesthesia, were enrolled in this study.
- They were divided into 4 groups: 10-19 year-old, 20-39 year-old, 40-69 year-old, and 70-89 year-old groups.
- No premedication was given.
- General anaesthesia was induced with 5% sevoflurane in 6 l.min⁻¹ oxygen via a face mask.
- After obtaining muscle relaxation using rocuronium 0.7 mg.kg⁻¹, i-gel was inserted.
- Immediately after i-gel insertion, the volatile anaesthetic agent was changed from sevoflurane to desflurane.
- The end-tidal desflurane concentration was maintained at 4.0% for 10 min to allow equilibration with cerebral anaesthetic partial pressure followed by a 1 min assessment of BIS taken at 10-sec intervals.
- BIS data were obtained from an average of 6 BIS values in 1 min, and recorded.
- The end-tidal desflurane concentration at which BIS was measured was predetermined by the up-down method (with 0.2% as a step size).
- MAC_{BIS50} was determined using the Dixon's up-and-down method and probit analysis.

Results

Patients' demographic data.

Group	10-19 year-old	20-39 year-old	40-69 year-old	70-89 year-old
Number of patients	22	20	18	24
Age(years)	15±3	29±7	56±7	75±5
Height(cm)	158±14	166±9	157±9	154±9
Weight(kg)	54±15	64±14	57±10	55±8
Sex(M/F)	12/10	11/9	5/13	8/16
End-tidal CO ₂ (mmHg)	37±2	37±2	36±2	36±1

Values are presented as mean ± SD.

10-19 year-old group

- MAC_{BIS50} of desflurane calculated using Dixon's up-down method was **4.16%**.
- MAC_{BIS50} of desflurane estimated with probit analysis was **4.28%**.

20-39 year-old group

- MAC_{BIS50} of desflurane calculated using Dixon's up-down method was **3.53%**.
- MAC_{BIS50} of desflurane estimated with probit analysis was **3.58%** (95% confidence intervals: 3.28 - 3.79%).

40-69 year-old group

- MAC_{BIS50} of desflurane calculated using Dixon's up-down method was **3.36%**.
- MAC_{BIS50} of desflurane estimated with probit analysis was **3.34%** (95% confidence intervals: 2.97 - 3.53%).

70-89 year-old group

- MAC_{BIS50} of desflurane calculated using Dixon's up-down method was **3.16%**.
- MAC_{BIS50} of desflurane estimated with probit analysis was **3.11%** (95% confidence intervals: 2.41 - 3.43%).

Conclusion

- MAC_{BIS50} of desflurane decreased with advancing age in patients aged 10 years and older ($P = 0.0013$) using a protocol that had small step size of end-tidal desflurane concentration and excluded drugs that could affect BIS value.