Sedation Scores in Target Controlled Infusions of Remifentanil and Dexmedetomidine

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Background: Dexmedetomidine (DEX) is an alpha-2 adrenoceptor agonist which has been given by infusion for sedation. Different methods have been used to assess the level of sedation. A significant difference was found between low/moderate dose and placebo[1] and at high dose infusion.[2] Remifentanil (REMI) is a potent analgesic with sedative side-effect. We sought to establish which sedation scale would correlate with a stepwise increase in DEX and REMI.

Method: With IRB approval and informed consent, five consenting healthy adult male volunteers aged 22-29 years old were infused via a computer-controlled infusion device sequential infusions of REMI and DEX to target plasma concentrations of 1/2/3/4 $ng.ml^{-1}$ and 0.6/1.2/1.8/2.4 $ng.ml^{-1}$ respectively. Target concentration was assumed to be reached following a 5 minute wash-in period and then maintained for 35 minutes. Sedation was assessed independently at each dose level by two observers using the Observer's Assessment of Alertness/Sedation (OAA/S) scale (composite and sum) and the Ramsey sedation score. A visual analogue scale of sedation ($VAS_{sedation}$) was then completed by the patient. A vertical mark was placed across a 100mm line with the endpoints "very awake" (=0) and "very sedated" (=100).

Results: For both drugs the four sedation scores at baseline and the four target concentrations were recorded. Values were recorded throughout the range of each sedation scale: Ramsey (1-6); OAA/S Composite (1-5); OAA/S Sum (9-20) and $VAS_{sedation}$ 0-100. The correlation between sedation score and target drug concentration was calculated. For REMI the R2 values were: $VAS_{sedation}$ 0.8; OAA/S Composite 0.06; OAA/S Sum 0.09, and Ramsey 0.004. For DEX the R2 values were: $VAS_{sedation}$ 0.34; OAA/S Composite 0.30; OAA/S Sum 0.43, and Ramsey 0.54. The mean $VAS_{sedation}$ at baseline and intervals were 9/31/58/80/85 for REMI, and 7/49/60/75/100 for DEX. Ramsey score of 6 and OAA/S Composite score 1 was recorded in 3/5 subjects, who were receiving DEX 1.8 or 2.4 $ng.ml^{-1}$.

Conclusion: Five healthy males received intravenous infusions of REMI up to 4 $ng.ml^{-1}$ and DEX up to 2.4 $ng.ml^{-1}$. The presence of variable levels of sedation was demonstrated by the presence of scores throughout the range of each scale. In this population, the only sedation score that showed correlation of increasing sedation level with increasing plasma concentration was the self-rated $VAS_{sedation}$ in the REMI group. The other scales did not show a correlation for either of the study drugs. At the lowest concentration of DEX (0.6 $ng.ml^{-1}$) there was evidence of marked sedation ($VAS_{sedation}$ 49) and further doses increased the sedation to a level approaching general anesthesia ($VAS_{sedation}$ 100). The $VAS_{sedation}$ was unable to differentiate the level of sedation within the range of 0.6-2.4 $ng.ml^{-1}$.

References:
[1] Anesth Analg 2000;90:699-705.
[2] Anesth 2000;93:382-94.

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