

Measures of anaesthetic dosing in elective orthopaedic patients.

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Excess anaesthesia can lead to intra-operative instability. Increased periods of EEG burst suppression are associated with postoperative delirium (Soehle et al.) We investigated 2 possible measures of anaesthetic load in a proof of principle study: a) the peak effect site concentration (C_{emax}) of the induction dose and b) the amount of anaesthetic gas given during maintenance. Our hypothesis was that these measures could be useful metrics of 'excess' anaesthesia.

Methods:

Both the Marsh and Schneider pharmacokinetic models (Absalom et al) were utilised. The calculated C_{emax} was compared to an established value of 2.8 $\mu\text{g/mL}$ (Iwakiri et.al). End tidal anaesthetic agent (ETAA) values from procedure start to finish were converted to age appropriate MACa values (Nickalls). A measure of 'excess' anaesthesia was calculated from the difference between the area under the MACa-time curve and the 1MACa-time curve. We applied our measures to fifteen patients (54 to 82 years) undergoing elective lower limb arthroplasty.

Results:

Using the Marsh model most patients received appropriate induction doses, however with the Schneider model, higher C_{emax} of were calculated. There was no correlation of C_{emax} with age but there were instances of excess induction doses with both models.

The mean 'excess' anaesthetic (described above) throughout the operation was 8.9(SD=23.5) MACa-minutes. The data suggested a relative greater 'age specific' dose of anaesthetic at higher ages, however this was not statistically significant ($p = 0.076$) and a larger patient cohort is needed.

Model	Marsh C_{emax} (induction dose)	Schneider (induction dose)	Time averaged MACa
Range observed	1.2 – 3.6 $\mu\text{g/mL}$	3.3 – 10.1 $\mu\text{g/mL}$	1.13 (SD 0.26)
Aim	2.8 $\mu\text{g/mL}$		1

Discussion:

The above measures may be useful metrics for assessing anaesthetic practice and for teaching. Also, in the future it may be possible to use these methods to investigate further the relationship of anaesthetic load and complications in the elderly population such as delirium.

References:

Intraoperative burst suppression is associated with postoperative delirium following cardiac surgery, Soehle M et al., *BMC Anesthesiol.* 2015; 115:61

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