EEG response of dexmedetomidine during drug induced sleep endoscopy

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Introduction: Dexmedetomidine is one of the anesthetics of choice for drug induced sleep endoscopy (DISE), with advantages including limited respiratory depression, analgesia, and decreased incidence of emergence delirium. However, challenges with determining sedation levels and prolonged recovery have limited its usage. An improved understanding of the effect of dexmedetomidine on the level of sedation and the corresponding electroencephalographic (EEG) changes could help overcome these barriers.

Methods: Fifty-one patients received dexmedetomidine sedation with Richmond Agitation-Sedation Scale (RASS) score assessment and continuous EEG monitoring via SedLine for DISE. We constructed a pharmacokinetic model to determine continuous dexmedetomidine blood concentration. From the SedLine, we extracted the patient state index (PSI), and from the EEG we calculated the spectral edge frequency 95% (SEF95) and the correlation dimension (CD), a type of fractal dimension used to assess the complexity of a system. These metrics were subsequently compared against one another and with the dexmedetomidine concentration.

Results: Our pharmacokinetic model yielded a two-compartment model with volumes of 51.8 L and 106.2 L, with clearances of 69.5 and 168.9 L/h, respectively, and a time to effect of 9 min, similar to prior studies. Based on this model, decreasing RASS score, SEF95, CD, and PSI were all significantly associated with increasing dexmedetomidine concentration ($p < 0.001$, $p = 0.006$, $p < 0.001$ respectively). The CD, SEF95, and PSI better captured the effects of increasing dexmedetomidine concentration as compared to the RASS score. Simulating dexmedetomidine concentration based on titration to target levels derived from CD and PSI confirmed commonly used dexmedetomidine infusion dosages.

Conclusion: Dexmedetomidine use for DISE confirmed previous pharmacokinetic models seen with dexmedetomidine. Complex EEG metrics such as PSI and CD, as compared to RASS score and SEF95, better captured changes in brain state from dexmedetomidine and have potential to improve the monitoring of dexmedetomidine sedation.