EFFECT SITE SEVOFLURANE LEVELS FOR AIRWAY MANIPULATIONS DURING RAPID WASH-IN

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Introduction: The advantages of effect-site guided intravenous infusions in anaesthesia are well established (1). We Havedevelopedasystemwhichprovidesrealtimeestimates of current and future end-tidal and effect site volatile anaestheticlevels(2)withtheoverallpurposeofextending the advantages of effectsite controlto inhaled agents.
Our system takes data from a Datex ADU with S/5 monitoring. The system provides an integrated trend display and uses the total fresh gas flow (FGF) and vaporisor settings along with current and past ET volatile levels to provide real time estimates of effect site volatile levels (Ceff) and forward predictions of ET and Ceff.
Dose requirements for inhaled agents are generally determined after allowing time for equilibrium and are characterised by ''MAC'' or EC50 values for a given stimulus. These equilibrium values should represent actual effect site levels.
The primary aim of this study was to explore effect-site levels required for insertion of classic LMA (Clma) or ETT under sevoflurane anaesthesia to validate the effect site approach. We also looked at Ceff at loss of response and used the data to develop time and dose based recipes for these interventions.

Methods: The study was approved by the regional ethics committee. We studied two groups of women aged 18–65, ASA-PS Class 1, 2 or 3, BMI <30. After preoxygenation with a FGF of 6 l/min, the vaporisor dial was turned to 6%. Normal tidal ventilation continued. Subjects were asked every 20 s to squeeze the hand of the research assistant. The point at which they first failed to respond was recorded. The attending anaesthesiologist was instructed to insert the airway at a predetermined value of Ceff as displayed. For the first subject in the cLMA study the target was 2.5 vol% and for the ETT study, 2.0 vol%. Succeeding values were determined using standard up and down methodology with a step size of 0.2 vol%. Patients who showed gross motor movement in response to airway manipulation were deemed responders. The study was completed after seven pairs of consecutive responders/non-responders. Airway manipulation data were primarily analysed by considering all results after the first transition (truncation method)(3).Alldatawereincludedinalogisticregression analysis to generate a log probit dose response curve.
Results: 76 ASA 1 or 2 subjects were recruited with 14 excluded. Mean age 38 year, range 22–66.
The mean time to LOR was 99 s (95%CI 89–109 s) with a mean ET-sevo of 3.1 vol%(2.7–3.6 vol%) and mean Ceff-sevo of 1.0 vol% (0.89–1.12 vol%). A sigmoid dose response curve was fitted to the loss of response data and EC95% values of 1.25 and 4.5 vol% respectively derived.
The EC50 for cLMA was 1.65 vol% (1.54–1.76) and for ETT insertion 3.06 vol% (2.94–3.17). The Figure 1 shows the sigmoid dose response curve for airway insertion.

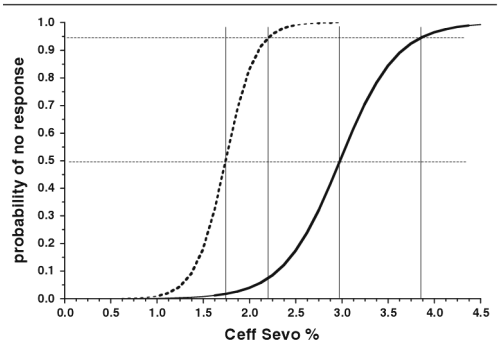

Fig. 1. Sigmoid dose response curves for response to insertion of cLMA (broken line) and ETT (solid line) with t1/2 = 3.2 min. The EC50 and EC95 for each curve are indicated.

Discussion: We determined the Ceff EC50 and EC95 for cLMA and ETT insertion with relatively narrow limits. We were also able to define dose and time based profiles that produce these values which allow use of our data without real-time Ceff estimation. These values are less than published EC50—equilibrium values although the ratio is similar. Using the recordedET-sevodatatorecalculateeffectsitevaluesforat1/2 of 2.0 min gives similar Ceff

values to published values. This is consistent with previous work suggestingdifferent effects may have different half times, presumably due to different sites of mechanisms of action. Although there are limitations to this study, our results provideadditionaldataofthevarious‘‘targets’’requiredat different stages of anaesthesia and surgery with volatile agents. This study also adds support to the concept of effect site guided anaesthesia delivery in general.

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