073 Regional anaesthetic brain susceptibility to propofol is linked with local $GABA_A$ receptor density

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Propofol is a GABAergic anaesthetic causing neuronal hyperpolarisation and large-scale cortical up/down oscillations. In humans, this is observable as slow waves (~ 1 Hz) on the electroencephalogram (EEG). EEG slow-wave activity saturation (SWAS) has been proposed as an individualised loss of perception measure suitable for depth of anaesthesia monitoring [1]. We hypothesised propofol dose needed to achieve SWAS (C_{SWAS}) in a brain region would relate to local $GABA_A$ expression.

Methods

Analysis used published 32-channel EEG collected in n = 16 healthy volunteers (eight female, age 28.6 ± 7 years) during intravenous propofol induction to 4 $\mu g.ml^{-1}$ effect-site concentration [1]. After re-referencing to scalp average and artefact rejection, slow-wave activity was extracted as power in 0.5–1.5 Hz band (4 s windows, 3 s overlap; MATLAB, Math Works Inc.). A four-parameter sigmoid dose–response curve was fitted to slow-wave activity on each electrode [1]. C_{SWAS} was identified as the propofol concentration at 95% power saturation. Subjects that did not reach SWAS due to insufficient dosing (n = 2) were excluded. Next, an in vivo atlas of $GABA_A$ receptor density ($GABA_A$ RD) previously obtained with [^{11}C]-positron-emission tomography (PET) [2] was projected onto n = 26 EEG cortical locations using FSL v6.0. Correlation between C_{SWAS} and local $GABA_A$ RD was tested using Spearman's rank test and its permutation p-value.

Results

The concentration required to achieve maximal slow-wave activity (C_{SWAS}) varied across the scalp with highest doses needed across centro-temporal regions (Fig. 1; mean C_{SWAS} = 3.50 (0.42) $\mu g.ml^{-1}$ across all subjects and brain regions, mean between-brain-region variability ΔC_{SWAS} = 0.60 (0.45) $\mu g.ml^{-1}$). Mean C_{SWAS} for a brain region significantly correlated with projected $GABA_A$ RD in that region (Spearman's $\rho = -0.66$, p = 0.0035).

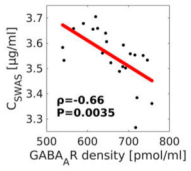

Figure 1 Correlation between group-average brain regional variation of propofol dose needed to achieve SWAS (C_{SWAS}) and scalp-projected $GABA_A$ receptor density. Dots = individual electrodes; line = linear best fit.

Discussion

We have demonstrated regional brain differences in susceptibility to propofol. Whole-brain slow-wave saturation may be needed for complete unconsciousness. Thus, varying propofol susceptibility across the brain means common clinical frontal EEG monitoring may underestimate propofol doses needed. Linking local $GABA_A$ expression and C_{SWAS} suggests slow waves link to neurobiology important during anaesthesia.

Acknowledgements

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References

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Approvals

REC	Approval obtained
R&D department	Advice not sought
Audit department	Advice not sought
Caldicott Guardian	Advice not sought
Consent	Written consent gained

074 Prevalence of undiagnosed obstructive sleep apnoea in an elective surgical patient population

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Obstructive sleep apnoea (OSA) may increase the risk of peri-operative adverse events but may be undiagnosed in surgical populations. Pre-operative detection of OSA would allow for appropriate changes to anaesthetic care, in order to improve patient safety. This study aims to determine the prevalence of undiagnosed OSA amongst surgical patients.

Methods

Patients > 18 years attending the South Infirmary Victoria University Hospital undergoing elective surgery without a previous diagnosis of OSA were included in the study. Written informed consent was obtained and the self-administered STOP-BANG Questionnaire (SBQ) was completed. Body mass index (BMI) and neck circumference were measured. The presence of certain medical co-morbidities was recorded.

Results

Of the 200 consecutive eligible participants screened, 24% (48/200) were found to be at high-risk (SB score ≥ 3) for OSA. The high-risk group were older males ($p < 0.001$) with a greater BMI and neck circumference ($p < 0.001$). There was a higher prevalence of cardiovascular disease in high-risk OSA patients ($p < 0.001$), patients with coronary artery disease were 1.2 times more likely to have an SB score ≥ 3 (95%CI: 1.104, 1.104, $p < 0.05$). Patients with hypertension were 2.2 times more likely to have an SB score ≥ 3 (95%CI: 2.089, 2.433, $p < 0.01$). There was a higher frequency of respiratory comorbidities amongst the high-risk group and these patients were 3.6 times more likely to have an SB score ≥ 3 (95%CI: 2.275, 4.415, $p < 0.05$). There was a higher prevalence of alcohol consumption and smokers in the high-risk group.

Discussion

A significant proportion of patients without a history of OSA, who present for elective surgery at an Irish university hospital were high-risk for OSA. The combination of anaesthesia and undiagnosed OSA may place these patients at increased risk for peri-operative complications and postoperative morbidity. The use of a simple screening questionnaire in pre-operative assessment could improve the detection of these patients to allow for appropriate adjustments to anaesthetic care, as part of an effort to reduce risk and improve patient safety.

Approvals

REC	Approval obtained
R&D department	Approval obtained
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Consent	Written consent gained