technique. Second, the number of examiners, characteristics of subjects to be examined (e.g. those with abnormal neck anatomy), and study design (e.g. crossover *vs* randomised controlled studies) may contribute to a high heterogeneity amongst the included studies. Third, the issue of whether the insignificant prolongation in procedural time associated with the use of an ultrasound-guided technique was partly attributable to heterogeneity of the included studies needs to be addressed by further large-scale studies.

In conclusion, the results of the current study show that the ultrasound-guided approach offered a significantly higher success rate in identification of the cricothyroid membrane than that using the palpation technique. However, we did not find significant differences in time for the two procedures. Nevertheless, because both techniques can be time consuming and because palpation often fails, our findings support that identification of the cricothyroid membrane should be done during the preoperative evaluation whenever possible and that examination of the patient should be performed with ultrasonography if landmarks are not clear.[9,10]

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Declarations of interest

The authors declare that they have no conflicts of interest.

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Entrainment of brain network oscillations in anaesthesia. Comment on *Br J Anaesth* 2020; 125: 330–335

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Editor—We read with great interest the recent article by Schmid and colleagues[1] on 'brainwave entrainment'. We share the authors' enthusiasm about entrainment of brain network oscillations and its potentially revolutionary implications for sedation and anaesthesia. Oscillation entrainment as a non-pharmacologic approach to neurostimulation has been proposed as the mechanism of action in a wide variety of applications such as clinical hypnosis and mindfulness, transcranial magnetic stimulation, transcranial alternating current stimulation, and deep-brain stimulation. All of these clinical and research applications have in common that they alter oscillatory behaviour of target networks in the brain following rational principles of target engagement (and ultimately precision medicine). Successful entrainment correlates with an improvement in undesired states such as anxiety, depression, pain, tremor, dyskinesia, or insomnia.[2] It is thus astonishing that entrainment as a tool has remained unexplored in anaesthesia and sedation, which modulate the dynamics of thalamocortical networks. We thus highly welcome the contribution by Schmid and colleagues.[1]

Unfortunately, their paper fails to provide proof of entrainment in their reported study, in that it details neither the exact frequencies of the stimuli nor the entrainment response of the brain as measured in the EEG. Although undertaking a trial of optoacoustic stimuli in patients receiving both general and regional anaesthesia (in this case caudal blocks) is both methodologically and ethically sound, the reduction in propofol dosage while maintaining a constant bispectral index (BIS) value does not demonstrate entrainment. The BIS index is a black-box proprietary algorithm[3] and is known to be strongly influenced by muscle activity.[4] Given our relative ignorance of how the various neurobiological signals are weighted in the BIS protocol, maintaining a given index value while reducing doses of the hypnotic agent allows but for vague inferences. In addition, rhythmical visual input may potentially engender eye movements even in anaesthetised patients; although the BIS monitor claims to be able to minimise the influence of this artifact,[3] it remains unclear if this holds true in the novel situation of strong visual stimulation during sedation.[5] Demonstration of entrainment requires direct evidence of a stable phase relationship between the applied perturbation and the resulting brain network signal (typically) measured by EEG. Without this, the true effect of the stimuli on the brain network activity remains hidden.

There is ample evidence from the sleep neurobiology literature that entrainment of neural oscillations to acoustic and transcranial current stimulation is possible in non-rapid eye movement sleep.[6] The cortical signals demonstrated to increase in response to external entraining stimuli include slow waves, delta oscillations, frontal alpha oscillations, and sleep spindles. All these signals play distinct functional roles in establishing sleep quality and general anaesthesia states.[7] One important feature of neural entrainment during sleep is that the response to the stimulation is highly state-dependent, which illustrates the importance of individualised and adaptive stimulation approaches.[8,9]

A final comment: the beta frequency band is generally ascribed to oscillations ranging from 12 to 30 Hz, not 14–100 Hz as claimed in the discussion.[10] This distinction is not hair splitting, as the disappearance of gamma activity (often 30–100 Hz), associated with loss of consciousness during induction, forms the basis of two of the four sub-parameters contributing to the BIS value.[3]

Despite these limitations of the present study, we are excited to see the increase in interest in this emerging field and are looking forward to new studies that more directly address the neurobiology of entrainment during anaesthesia. Leveraging the neurobiological understanding stemming from the sleep literature makes more fine-tuned success in the field of anaesthesia highly likely.

Declarations of interest

The authors declare that they have no conflicts of interest.

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