

## Is alternate placement of entropy electrodes really valid?

Sir,

We read with great interest the article by Richa Sharma *et al.*, in which they retrospectively reviewed 20 patients undergoing supratentorial craniotomy monitored for depth of anaesthesia using the new entropy sensors (P/N M1038681 GE Healthcare, Helsinki, Finland). They describe a modified way of placing the sensors bilaterally. Ten patients who underwent orbitozygomatic craniotomy had all three sensors applied in the recommended unilateral fashion and in remaining 10 patients who underwent bifrontal craniotomy, the sensors were applied in a modified fashion to avoid the surgical incision that is, the electrode no. 1 and 3 were placed on bilateral temporal regions and electrode no. 2 in between the eyebrows. They found that altering the placement of sensors from the prescribed unilateral arrangement to a bilateral arrangement did not alter the correlation of both State Entropy (SE) and Response Entropy (RE) with End tidal MAC values of inhalational anaesthetic agents.<sup>[1]</sup>

On perusing the patent document for the method of positioning entropy electrodes, we found that the electrode no. 1 is the reference electrode with an added purpose of obtaining electromyographic (EMG) signals from facial muscles (corrugator, procerus, frontalis and orbicularis oculi muscles), and should be placed either above the eyebrows or in between them. The explorer electrode (electrode no. 3) should be placed on the frontolateral area of the frontal lobe (FT 9/10 montage) to obtain predominantly a cortical electroencephalographic signal (EEG) and the ground electrode should be placed between the above two electrodes.<sup>[2]</sup>

Thus placing electrode no. 1 in the temporal region would hamper accurate measurement of the facial muscle EMG signals and the Response Entropy (RE) value may be erroneous. A better arrangement of electrode may be placement of electrode no. 1 in its prescribed position (between eyebrows) and electrode no. 2 in the contralateral temporal region. This arrangement would,

however, cause the ground electrode to be at unequal distances from the other electrodes, and hamper in optimizing Common Mode Rejection Ratio (CMRR) of the measured signal.

The authors state that entropy values correlated well with the clinical indices of depth of anaesthesia (haemodynamic and end tidal anesthetic concentration). We could not find any data related to the haemodynamic changes mentioned in the methodology. We also noted that no statistical analysis indicating the correlation between RE value and MAC value is presented in the article.

Our aim of writing this letter is to point out that the study has major limitations in terms of design of the study (justification for choice of electrode placement sites), incomplete interpretation of valuable patient data (haemodynamics) and absence of statistical analysis and thus should be interpreted with caution.

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