index ranges (90 and 98, respectively). The response by both patients warranted additional i.v. anaesthetic prior to application of the electrical stimulus. Fortunately, neither of the patients reported awareness of the procedural events.

Consequently, we no longer use bispectral index monitoring alone to assess pre-ictal anaesthetic depth in patients receiving ECT.

Moreover, Zand and colleagues recently reported that the BIS was not a reliable monitor of anaesthetic depth during Caesarean section and that BIS values lower than previously recommended are needed to avoid isolated extremity responses. They suggest, for a sensitivity of 100%, that the BIS value should be lower than 27 to ensure that all patients are truly unconscious.

Declaration of interest
None declared.

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Reliability of bispectral index analysis in patients undergoing Caesarean section

Editor—We read with interest the article by Zand and colleagues entitled ‘Survey on the adequacy of depth of anaesthesia with bispectral index and isolated forearm technique in elective Caesarean section under general anaesthesia with sevoflurane’. They conclude that bispectral index analysis (BIS) is not a reliable method for monitoring depth of anaesthesia in Caesarean section and that lower than previously recommended values are needed to avoid isolated forearm technique test responses during laryngoscopy, intubation, and skin incision. We do not feel that this conclusion is representative of our practice in the UK, where usual doses of thiopental are higher, at 5–7 mg kg$^{-1}$.1

The other issue raised is the reliability of BIS in the first 2 min of induction due to a lag time in the speed of onset of BIS monitoring, in addition to the delay in neurone receptor dynamics.2 The time delay of descending (induction) and ascending (awakening) recordings of electroencephalogram index calculation can take 14–155 s, so we cannot draw any conclusion of real-time awareness at times such as during rapid sequence induction and endotracheal intubation. Finally, in our view, BIS could be very useful in situations such as postpartum haemorrhage, where uterine atony may be decreased by the reduction of the concentration of volatile agent.6

Declaration of interest
None declared.

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Avoiding awareness in Caesarean sections under general anaesthesia

Editor—The recent paper by Zand and colleagues was of interest to us (a group of British anaesthetic trainees) because routine Caesarean sections are rarely performed under general anaesthesia in our practice.1 2 As such, we would find this medical device assessment difficult to perform. Nonetheless, these results have the potential to impact our practice. Inclusion of the patient characteristics and indication for the procedure would help us to transfer these findings to our clinical context.

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We would be grateful for more information relating to the anaesthetic technique used. The paper states that the inspired concentration of sevoflurane was set at 1.8–2.2%. It would be helpful to clarify whether this was the concentration set on the vaporizer or measured in the circuit. End-tidal concentration of anaesthetic agent is a useful indicator of depth of anaesthesia; it would be useful to know the correlation between bispectral index and isolated forearm technique responses in this population.

The mode of ventilation and rate of thiopentone infusion are not noted; both have the potential to impact the cardiovascular status of the patients and the perfusion of the uteroplacental unit. In future studies, we would find intraoperative cardiovascular parameters useful to appreciate the tension that sometimes exists between depth of anaesthesia and cardiovascular stability.

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1 Zand F, Hadavi SM, Chohedri A, Sabatian P. Survey on the adequacy of depth of anaesthesia with bispectral index and isolated forearm technique in elective Caesarean section under general anaesthesia with sevoflurane. Br J Anaesth 2014; 112: 871–8


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Isolated forearm movement does not equate to awareness

Editor—we read with interest the paper by Zand and colleagues concerning the adequacy of anaesthesia and the bispectral index (BIS) as assessed using an isolated forearm technique. We would like to comment on their interpretation of the isolated forearm response, in which they considered a ‘firm clenching/flexing movement’ as being a purposeful response and thus indicative of wakefulness.

The isolated forearm technique is at present the only method of assessing wakefulness in the patient who has been administered neuromuscular blocking drugs. However, it is crucial that any movements in that arm be interpreted carefully in order to distinguish an intentional movement from a reflex motor response. A definitive sign of wakefulness during anaesthesia requires not only a movement that is precise and directed, but also confirmation of that movement in response to a second command, neither of which appears to have been part of this study’s protocol. We therefore question whether the isolated forearm responses in the paper by Zand and colleagues genuinely represent intentional movement at all.

At our institution, we have recently conducted a study using a similar isolated forearm technique. We found that subjects who had been anaesthetised with propofol and rocuronium alone would periodically make spontaneous flexion movements with the isolated forearm. These movements consisted of firm hand grip with some elbow flexion, which lasted several seconds and which were repeated multiple times over the next few minutes. The subjects would not relax the hand or forearm to command, nor would they repeat the movement when requested immediately afterwards. That is, these movements were not in response to command, could not be repeated on command, and were gross movements rather than specific (e.g. ‘squeeze my fingers twice’). These movements occurred with BIS values between 25 and 40 after a 3 mg kg\(^{-1}\) dose of propofol. When the effect of the bolus dose of propofol had decreased some minutes later, the subjects responded correctly to command with fine and prompt responses, which were repeated immediately afterwards when commanded by the investigators.

We do not consider that such responses were an indication of awareness, but instead were a complex subcortical motor response, most probably due to the noxious stimulus of the high-pressure cuff required to isolate the arm. Zand and colleagues do not appear to have considered this possibility, but have instead interpreted any movement of the isolated arm as evidence of awareness, without confirming it by a follow-up command. Furthermore, they rate a gross muscle movement as being of more significance than a fine motor movement, which in our opinion is mistaken.

The response of the BIS to neuromuscular blockade is indeed questionable, but we do not feel that the conclusions of Zand and colleagues that the ‘BIS should be lower than 27’ or that the anaesthetic protocol was ‘not sufficient for providing adequate depth of anaesthesia’ are justified purely on the basis of non-specific isolated forearm movements. A firm flexor response in an isolated forearm without subsequent confirmation to command is not evidence of intentional movement.

Declaration of interest
None declared.