Response to the letter by Vedran Deletis, David B. Mac Donald, Francesco Sala and Isabel Fernandez Conejero

We wish to thank the authors of this Letter to the editor for their interest in our article. We are pleased that members of the International Society for Intraoperative Neurophysiology (ISIN) support much of the content and wholeheartedly embrace our concern regarding the value of remote monitoring and automated IOM devices. However, some objections have been raised about data and statements in this article [1], we wish to present our arguments point by point.

1. We agree with ISIN members that IOM must be performed as continuously as possible, in order to assess the functional integrity of neural structures at risk during critical surgical steps. However, from a practical point of view, IOM, whatever the technique used (SSEP, MEP, NMEP or D-waves) cannot be performed on a strictly continuous basis, notably during the use of diathermy knife. We recall that some neurologic complications may have occurred while no instrumental correction was being performed. We have thus indicated that IOM consists of subcontinuous evaluation of spinal cord sensorimotor functions during surgery, meaning of course as continuously as possible.

2. NMEP (neurogenic mixed evoked potentials) are used not only in France but also by other teams in charge of severe paediatric spinal deformities, for example in USA [2,3]. Finally, there is only one clinical article that describes NMEP false negatives [4]. Conversely, two articles describe MEP (motor evoked potentials) false negatives [5,6] even if severe technical flaws have been highlighted [7].

NMEP consist of a prominent early biphasic component followed by small amplitude polyphasic components. Based on data provided by collision studies [8,9], it appears of particular importance during IOM performed with NMEP to look at the persistence of polyphasic components. Some true positive NMEP alerts are composed of a disappearance of this polyphasic component with persistence of the earlier monophasic component [10]. In this observation (N=4), a wake up test elicited satisfactory movement in both legs. Instrumentation was thus maintained. This patient post-operatively presented brisk reflexes in both legs lasting 10 days, without sensory modification, and then recovered completely.

Moreover, we have the experience of NMEP alerts without significant change of SSEP. As an example, a patient post-operatively presented a proximal motor deficit with altered MEP and preserved SSEP, MRI showing increased T2 signal in the lateral part of the spinal cord. Based on these collision studies and clinical data, it seems thus rather more logical to use the nomenclature ‘neurogenic mixed evoked potentials’ than the nomenclature ‘neurogenic sensory evoked potentials’ as proposed.

In the reference cited by Deletis et al. [4], in one of the two cases, the authors noticed that NMEP responses comprised less polyphasic components but these changes were attributed to change of recording sites (from ankles to popliteal fossae). We however agree that we should have cited this reference [4] and discussed this point in the synthesis.

Moreover, NMEP are easily performed in very young children. In the case of monitoring alert, NMEP allowed the assessment of a lesional level, by moving the epidural flexible spinal electrode along inter-vertebral spaces. Diagnosing a lesional level helps the surgical team to identify the monitoring alert aetiology and thus to react in the most informed and appropriate way.

3. In the very informative paper cited by Deletis et al. [11], D wave recordings were attempted in 19 children younger than 36 months. A D-wave was present in only 7 children (21–36 months) and absent in the remaining 12 children (8–31 months). It thus appears that in small children, generally under 4 years of age, the neurophysiologist in charge of IOM can try to record D-waves but is not able in advance to plan to perform the IOM with D-waves, since in more than 50%, D-waves will be unobtainable.

4. That poor quality monitoring is worse than the absence of monitoring, at risk of wrongly reassuring the surgical team, is obvious. However it has been demonstrated that unimodal monitoring, using SSEP, halved paraplegia risk during scoliosis surgery [12,13]. Unimodal monitoring using SSEP or an intra-operative wake up test are monitoring techniques that remain preferable to the absence of monitoring. Multimodal monitoring, adapted to neural structures at risk, and to the patient’s age, performed by a trained neurophysiologist, appears of course to be the most reliable technique.

As a point of detail, Deletis et al. have indicated that some MEP false negative cases were in fact attributed to inadvertent inversion of the recording leads from upper and lower extremities [5]. However, in this reference [5], a false negative MEP is described but appears to be related to automated measurements of a 60-Hz artifact [7]. It was in fact in a different article [6] that a described MEP false negative appears to be related to inadvertent inversion of the recording leads from the upper and lower extremities [7].

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References


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