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Magnetic motor evoked potentials in newborns with spina bifida

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Clinical background

This study is part of the multidisciplinary research program "Prognosis of Spina Bifida" of the Radboud University Nijmegen (The Netherlands). Outcome prediction of spina bifida is difficult and an ongoing discussion about quality of life and selective treatment exists. Since new diagnostic instruments have become available, revision of the Lorber criteria, which were set in 1970, is warranted. Hence, we investigated the applicability of magnetic motor evoked potentials (MEP) in a prognostic model for spina bifida and we aim to determine motor conduction in neonatal spina bifida.

Materials and Methods

Magnetic stimulation of cervical and lumbar roots and the cortex was performed in 19 newborns with spina bifida (13 myelomenigocele, 3 myeloschisis, 1 lipomyelomeningocele, 2 spina bifida occulta). Responses were recorded from the tibialis anterior (TA), the quadriceps femoris (QF) and the biceps brachii (BB). As a control, responses were obtained from the TA by electrical peroneal nerve stimulation. Correlations between response characteristics (latency and amplitude) and clinical characteristics (neurosegmental motor level and type of the spinal lesion) were evaluated.

Results

Lumbar and cervical stimulation revealed responses in all target muscles in twelve subjects, responses in both the TA and QF in three subjects, responses just in the BB in two subjects and responses in just the TA or QF each in one subject. In contrast, cortical stimulation revealed responses in the BB or the QF each in one single subject only. Statistically significant left-to-right correlations were evident for amplitude, but not for latency. Correlations between neurosegmental motor level and latency and amplitude could not be demonstrated, but a difference in amplitude between different types of lesions appeared to exist.

Conclusion

The results have shown that MEP is applicable in newborns with spina bifida. The findings demonstrate that excitable neural tissue is present in or under the spinal lesion, even in very severe types of spina bifida. This is congruent with neuropathological studies. In addition, we were also able to determine motor conduction under the spinal lesion. Cortical stimulation was difficult, however; methodological aspects are likely to account for this. Still, we were able to detect corticospinal motor conduction over the spinal lesion in one infant with a thoracic myelomeningocele. Further considerations about functional implications, neuro-embryological aspects and prognostic value of these results will be discussed.