Prognostic Value of Transcranial Magnetic Stimulation in Acute Stroke

Nilgun Araç; Ayse Sağduyu; Seccad Binai; Cumhur Ertekin

Background and Purpose The aim of this study is to evaluate the role of motor-evoked potentials (MEPs) in predicting functional recovery of hemiparesis and hemiplegia in acute stroke patients.

Methods Twenty-seven acute stroke patients were evaluated clinically and electrophysiologically within the first week and 3 to 6 months after the event. Clinical assessment included a quantitative evaluation of motor ability and activities of daily living. MEPs were recorded from the abductor pollicis brevis and tibialis anterior muscles bilaterally. Correlations between clinical parameters and MEPs were assessed.

Results In the acute period, no MEP could be detected in 17 of 27 patients. In these 17 patients, the clinical scores were worse than in the patients whose MEPs could be elicited. However, in the follow-up period (3 to 6 months), no significant differences in motor function were observed between the two groups.

Conclusions In the acute phase of stroke, neurophysiological parameters were correlated with the clinical findings, but MEPs had no value in predicting the outcome of hemiparesis and hemiplegia. (Stroke. 1994;25:2183-2186.)

Key Words • hemiplegia • prognosis • stimulation, transcranial magnetic • stroke, acute
Clinical and Electrophysiological Features of 27 Patients: Initial and Follow-up Examination

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<th>Patient No./Age, y/Sex</th>
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<th>3-6 Months</th>
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CT indicates computed tomography; MEPs, motor-evoked potentials; MFI, motor function index; Th, thenar; TA, tibialis anterior; F, female; M, male; L, left; R, right; MCA, middle cerebral artery; CSO, centrum semiovale; ACA, anterior cerebral artery; N, normal central conduction time; P, prolonged central conduction time; A, absent response; Nf, no follow-up examination; and Ex, died due to stroke within 3 weeks of onset.

*Muscle strength: 0, no strength; 5, full strength.

Results

Patients were categorized in two groups according to the appearance of MEPs recorded from thenar muscles on the affected side: (1) patients without MEPs (nonresponsive group) and (2) patients with MEPs (responsive group). All MEPs, whether normal or altered in amplitude and/or latency compared with those of the normal side, were included in the responsive group. All individual results are shown in the Table.

In the acute stage of stroke, according to thenar recordings no response was obtainable in 17 patients. Their mean MFI was 4.52. Ten patients had normal or prolonged CCT at initial examination despite motor deficit. Their mean MFI was 3.2.

According to tibialis anterior recordings, the nonresponsive group included 17 patients; their mean MFI was 4.27. In the responsive group, there were 10 patients whose mean MFI was 3.4. There was a good correlation between MFI and MEP responses in both groups. In the nonresponsive groups, MFI was significantly higher in comparison to the responsive groups.

The results were not different in both functional motor assessments according to Rankin Scale and Barthel Index scores ($P<.01$) (Fig 1A and 1B).

Three to 6 months later, responsive and nonresponsive groups were compared according to the improvement rates in their motor function scores. Functional motor recovery was significant in both groups, and there was no statistical difference (Fig 2).
The comparison of MEP responses in the acute phase of stroke according to the lesion types showed no significant difference in hemorrhage or infarct group. In the follow-up period, functional motor recovery rates did not differ significantly in the two groups (Fig 3).

According to the stroke location as imaged by CT scan, 19 patients had cortical (17 infarcts, 2 hemorrhages) and 8 had subcortical (6 hemorrhages, 2 infarcts) lesions. MEP response was absent in 13 patients with cortical lesions and 4 with subcortical lesions.

Discussion

Transcranial magnetic stimulation is a safe and non-invasive procedure that provides objective information about central motor pathways. The purpose of this study was to assess the value of MEP as a predictor of prognosis in acute stroke patients. Our results indicate that in the acute phase of stroke, MEP correlates well with the severity of neurological deficit. This finding is compatible with the other studies made by transcranial electrical and magnetic stimulation.

Follow-up studies after 3 to 6 months demonstrated that functional motor recovery was not significantly different in the responsive and the nonresponsive groups to transcranial magnetic stimulation. This finding is at variance with the series of Dominkus et al, Abbruzzese et al, and Heald et al probably because of the differences in patient selection, timing of the first assessment, and methodology. In two of these studies, only arm recordings were taken into consideration. However, we assessed both arm and leg recordings. We believe that arm recordings only do not always reflect the prognosis accurately. Three patients in our series (Nos. 12, 14, and 20) who had leg but not arm responses in the acute stage were improved at follow-up (Table). Nevertheless, our results are in concordance with other recent studies.

According to the lesion types, in the acute phase of stroke, MEP findings were not significantly different in patients with infarcts and hemorrhages. In the follow-up period, the degree of functional motor improvement was not different in the infarct and hemorrhage groups. Depending on stroke location, there were more absent MEPs in patients with cortical lesions. At follow-up, the degree of motor improvement was relatively better in patients with subcortical lesions. Similar findings have been reported by several authors. It is suggested that absent MEP and normal MEPs were seen after both cortical and subcortical strokes, but only subcortical involvement increased latency of cortical MEPs.

In conclusion, MEPs are well correlated with the clinical findings in acute stroke, but the absence of MEP does not necessarily indicate a poor prognosis. Furthermore, contrary to the findings of several studies, our data do not support the use of MEPs in accurately predicting prognosis of motor recovery after acute stroke.

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References


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