

The Predictive Value of Motor-Evoked Potentials and the Silent Period on Patient Outcome after Acute Cerebral Infarction

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Background: The predictive value of neurophysiologic assessment on patients' outcome after acute cerebral infarction is poorly understood. The aim of this study was to investigate the prognostic value of motor-evoked potentials (MEPs) and the silent period (SP) on clinical outcome. *Methods:* A total of 202 patients with acute cerebral infarction were prospectively recruited. MEP and SP were recorded from the abductor pollicis brevis of the affected side within 10 days after stroke onset. Patient outcome was measured as the dependency rate. *Results:* Cortical MEP was induced in 78 patients whereas it was absent in 82 patients. The initial NIHSS (National Institutes of Health Stroke Scale) score was significantly lower in patients with MEP than in those without MEP ($P < .001$). Regression analysis demonstrated that a left-sided lesion (OR = .391, 95% CI .178-.858, $P = .019$), NIHSS at admission (OR = .826, 95% CI .744-.917, $P < .001$), and presence of MEP (OR = 3.918, 95% CI 1.770-8.672, $P < .001$) were independent predictors of outcome 3 months after stroke. Among patients with MEP, only the contralateral cortical SP value was significantly shorter in the good outcome subgroup ($t = 2.541$, $P = .013$). Receiver operating characteristic curve analysis demonstrated that SP was able to predict patients at higher risk of unfavorable outcome 3 months after stroke onset (area under the curve .721, 95% CI .58-.86, $P = .008$). *Conclusions:* These data suggested that MEP and SP were useful tools to predict patients' acute outcomes following cerebral infarction. **Key Words:** Cerebral infarction—outcome—transcranial magnetic stimulation—motor-evoked potentials—silent period.

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Introduction

Stroke is the second most common cause of death and the leading cause of disability worldwide.¹ Ischemic stroke is the most common subtype of stroke, accounting for approximately 87% of all stroke cases.² Some neurological scales, such as National Institutes of Health Stroke Scale (NIHSS) and modified Rankin scale (mRS),^{3,4} have prognostic values in predicting patient outcome. However, it is very difficult to evaluate patients using neurological scales when they suffer from aphasia, apraxia, or sensorimotor neglect.

Transcranial magnetic stimulation (TMS) is a noninvasive, effective neurophysiologic technique that activates the motor area to obtain information about the function of motor pathways of the central nervous system.⁵ Motor-evoked potentials (MEPs) followed by a silent period (SP) can be elicited using TMS to stimulate the primary motor

cortex, which reflects the motor function of the muscles of the contralateral upper limb.⁶ Several studies have demonstrated the prognostic values of MEPs and the SP.^{7,8} However, the prognostic value of SP elicited with TMS in the acute stage of cerebral infarction is still poorly understood. Therefore, it is imperative for clinicians to identify reliable prognostic tools for patient recovery and outcome after acute stroke.

Materials and Methods

Subjects

A total of 426 consecutive patients diagnosed with acute stroke between January 2013 and December 2014 were prospectively registered from the Department of Neuro-rehabilitation of Tianjin Huanhu Hospital in Tianjin, China. A clinical diagnosis of cerebral infarction was made according to the World Health Organization's criteria, and all diagnoses were confirmed using brain computed tomography or magnetic resonance imaging.⁹ Patients were included only if they had a cerebral infarction with

weakness or impairment of finger dexterity in the affected hand on clinical testing. They were treated according to the current guidelines for the early management of patients with acute ischemic stroke.⁹ Patients diagnosed with transient ischemic attack and primary cerebral hemorrhage, those with a poor prognosis for survival (loss of consciousness or severe comorbidities), those with pre-existing disabilities of the extremities, and those with neurological deterioration were excluded from this study. Neurological deterioration was defined as an increase in the NIHSS score by greater than or equal to 2 points after measurement with TMS compared with initial NIHSS score.¹⁰

A total of 202 patients fulfilled the following inclusion criteria: age more than 18 years; time from symptom onset to admission less than or equal to 24 hours (time of symptom onset was defined as the time when the patient was last seen normal); and TMS measurements performed within 10 days after admission (182 patients; 7.22 ± 2.16 days). The corresponding flowchart is shown in Figure 1.

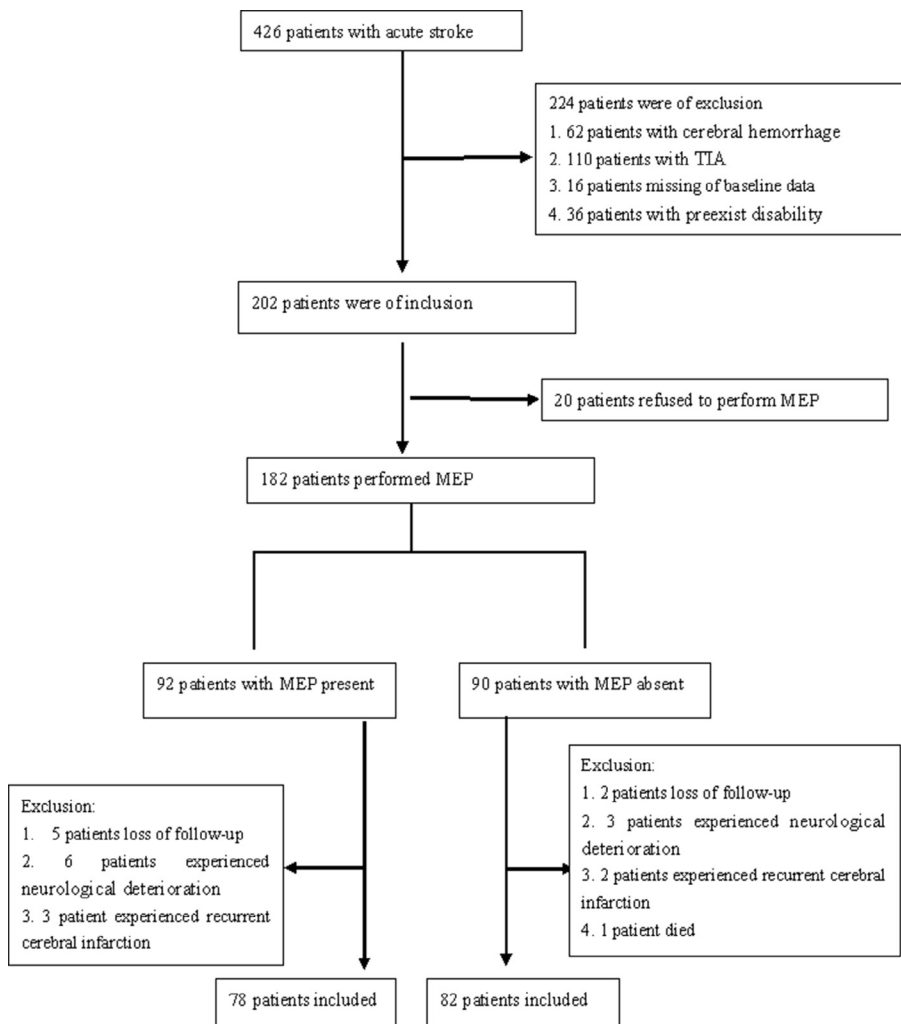


Figure 1. Flowchart of this study. Abbreviations: MEP, motor-evoked potential; TIA, transient ischemic attack.

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