

## Change of Magnetic Motor Evoked Potentials in Hemiparesis due to Cerebral Infarction

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### - Abstract -

**Background and Objectives** : The Motor evoked potentials (MEP) study may be useful in the evaluation of the degree of impairment in the motor nervous system and in the determination of the prognosis. The purpose of this study is to evaluate the status of central nervous system in acute and subacute state of cerebral ischemia by comparing the changes of MEP in the initial and follow-up study. **Methods** : Twenty patients with hemiparesis caused by ischemic stroke were recruited for this study. We tested MEP within 7 days and followed-up after 14 days after symptom onset. The cerebral motor cortex area, cervical area for upper extremity and lumbar area for lower extremity were stimulated by transmagnetic stimulator. The central motor conduction time(CMCT) was measured with the difference in MEP caused by stimulating the vertical area and spinal area. The CMCT of hemiparetic patients were classified into three groups-normal, delayed, and no evoked MEP groups. **Results** : The CMCT in hemiparetic side of acute ischemic stroke patients were significantly delayed ( $P < 0.05$ ) compared with the control group. The CMCT of hemiparetic side in the follow-up study showed no significantly difference in comparison to the control group. The prognosis of motor improvement was better in the groups of delayed MEP than the groups of no evoked MEP. **Conclusion** : The CMCT of hemiparetic and contralateral sides were delayed in acute ischemic stroke, compared with control group and were returned to normal boundaries in subacute state. But in the most cases with no MEP response in the initial study, also showed no MEP response in the follow-up study. The recovery occurred in the subacute state in cases with mild hemiparesis, whereas recovery did not occur in the subacute stage in case with severe hemiparesis.

**Key Words** : Motor evoked potential, Central motor conduction time, Stroke

(motor evoked potential, MEP)

1980 Merton <sup>2</sup>

가  
가  
가

. 1985 Barker 가 <sup>3</sup> 57.7 ± 11.0 ,  
61.8 ± 9.7 (Table 1).

2.

Berardeli 가 <sup>6</sup>

, Dominkus 가 <sup>7</sup>

int TM(Dantec , Denmark) Keypo-  
14cm MagLife(Dantec , Den-mark)  
7cm

가

가

가

7

가

<sup>9,10,11</sup>가

가

5

4-5

가

<sup>12</sup>.

60 ~ 100%

1.

1998 8 20 1998 3  
27 3  
4 20  
20 14 6  
13 20 7

1/3

4cm

4-5

**Table 1.** Age and sex distributions of normal controls and patients

Age (years)	Controls			Patients		
	M	F	Total (%)	M	F	Total (%)
30 - 39	-	2	2 (10)	-	-	-
40 - 49	-	4	4 (20)	1	-	1 ( 5)
50 - 59	2	4	6 (30)	5	5	10 (50)
60 - 69	3	2	5 (25)	3	-	3 (15)
70 - 79	2	1	3 (15)	5	1	6 (30)
Total (%)	7	13	20 (100)	14	6	20 (100)

M : man  
F : woman

(standard deviation)

7

, 14

(Fig. 1,2).  
Rankin Scale<sup>13</sup>

가 Modified

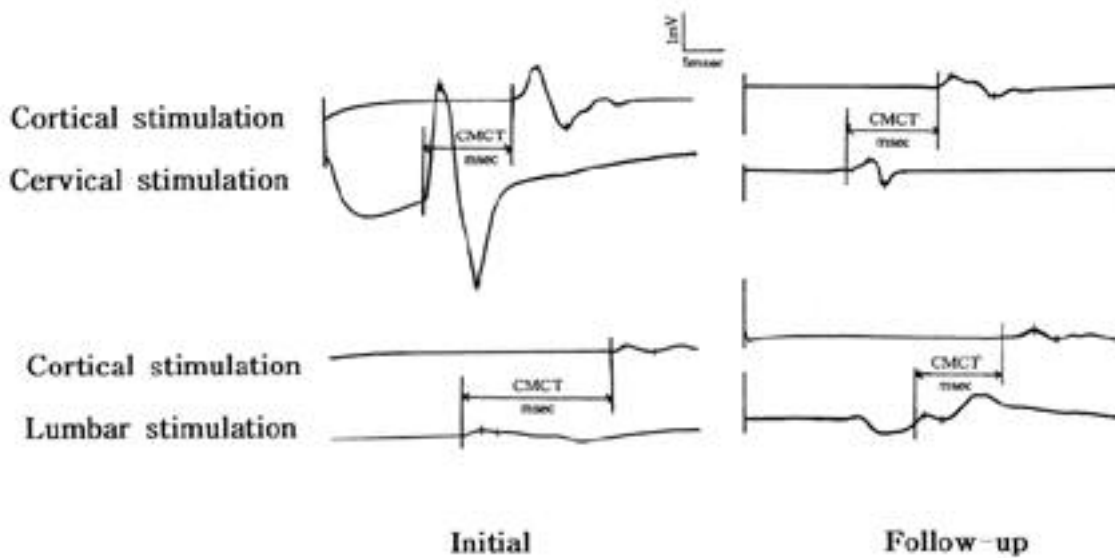
Student's t-test

P < 0.05

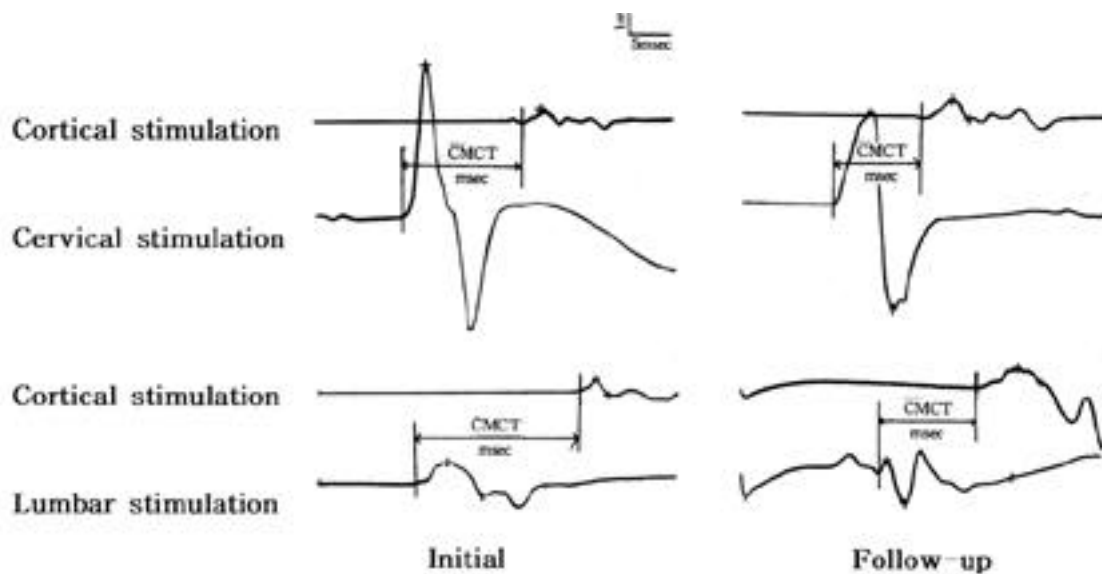
3.

1.

Modified Rankin Scale(MRS)	3	20	
	7.0 msec	11.4 msec	9.43 ± 1.45
	msec		13.0 msec



**Figure 1.** Motor evoked potentials (MEP) recorded from the affected side in a patient. The initial upper CMCT (14.6 msec) was delayed, and the follow-up upper CMCT (10.2 msec) was within normal limit. The initial lower CMCT (19.9 msec) was delayed, and the follow-up lower CMCT (13.2 msec) was within normal limit.



**Figure 2.** Motor evoked potentials (MEP) recorded from the contralateral side of hemiparesis in a patient. The initial upper CMCT (9.3 msec) and the follow-up upper CMCT (8.3 msec) were within normal limit. The initial lower CMCT (15.8 msec) and follow-up lower CMCT (10.3 msec) were within normal limit.

21.1 msec  
(Table 3). 15.42 ± 3.44 msec

3.

2.

10.41 ± 1.83 msec, 17.81 ± 5.27 msec

15 20 가 17 가

(Fig. 3), 10.30 ±

13.10 ± 4.43 msec, 19.93 ± 2.69 msec 16.46 ± 4.75 msec

4.86 msec

가 (Fig. 4).

(P < 0.05, Fig. 3).

20

4.

13.48 ± 4.10 msec, 17.97 ± 5.19 msec

Modified Rankin Scale (MRS)

(P < 0.05, Fig. 4).

3

**Table 2.** Normal values of CMCT in the normal control group

	CMCT (msec)	Range (msec)
Vertex - C7	9.43 ± 1.45	7.0 ~ 11.4
Vertex - L4-5	15.42 ± 3.44	13.0 ~ 21.1

Values are : mean ± S.D

CMCT : central motor conduction time

3

MRS

(Fig. 5).

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10 ,

가

5

10

**Table 3.** Clinical and electrophysiological features of upper and lower extremity of 20 patients after stroke

Cases	Age/Sex	Upper extremity MEP				Lower extremity MEP				MRS	
		Initial		F/U		Initial		F/U		Initial	F/U
		CCTX	CCT	CCTX	CCT	CCTX	CCT	CCTX	CCT		
1	59/F	9.0	9.5	9.9	9.7	21.4	20.1	19.0	20.1	2	1
2	70/F	nm	12.5	16.4	11.0	20.1	22.3	17.6	10.4	5	5
3	67/M	nm	17.0	nm	18.5	nm	16.5	nm	21.2	5	4
4	75/M	nm	17.1	nm	6.6	nm	15.1	nm	23.4	5	4
5	56/M	11.7	16.5	8.5	13.0	19.1	14.3	17.0	12.7	4	2
6	56/F	10.0	8.4	9.7	7.6	15.6	14.7	15.4	13.8	3	1
7	75/M	10.6	12.0	11.0	13.3	16.3	21.6	18.5	13.8	1	0
8	58/M	11.1	10.9	10.7	10.5	15.3	19.5	25.9	23.5	2	2
9	46/M	22.7	21.9	18.2	12.5	23.7	12.8	22.6	10.5	3	2
10	56/F	11.0	10.2	11.0	10.3	31.0	19.5	10.1	15.2	2	2
11	52/F	9.8	10.8	10.2	9.7	15.4	21.5	11.6	10.9	1	0
12	50/M	14.6	9.3	10.2	8.3	19.9	15.8	13.2	10.3	1	0
13	52/M	12.6	11.3	9.2	9.4	19.7	14.5	19.9	13.2	1	0
14	73/M	nm	12.4	nm	11.5	nm	16.5	nm	11.1	5	5
15	77/M	nm	14.2	nm	7.0	18.3	11.2	14.2	14.6	5	4
16	68/M	8.5	12.7	8.5	8.6	15.6	11.5	12.6	14.5	3	2
17	69/M	17.7	14.5	12.5	11.5	24.2	23.3	24.1	23.4	4	2
18	52/F	11.2	9.7	8.9	7.9	19.2	22.4	18.5	18.3	3	1
19	70/M	15.3	15.3	8.9	8.7	27.2	26.9	21.3	21.2	2	0
20	56/M	22.8	20.8	13.3	11.3	27.2	25.6	27.1	21.2	3	1

M : man, F : woman, F/U : follow-up, CCTX : central motor conduction time of the affected side

CCT : central motor conduction time of the contralateral side of hemiparesis, MRS : Modified Rankin Scale score, nm : not measured

가  
 , MRS 2.1  
 1.1 (P  
 < 0.05).  
 MRS 2.6  
 1.0 (P < 0.05).  
 가 5  
 5, 4.4 MRS  
 가 .

가  
 . 1984 Cowgan<sup>1</sup>  
 가 .

1870 Hughlings  
 Jackson ,  
 가 .  
 Fitsch<sup>14</sup>  
 . 1980 Merton<sup>2</sup>

가  
 . 1985 Barker<sup>3</sup>  
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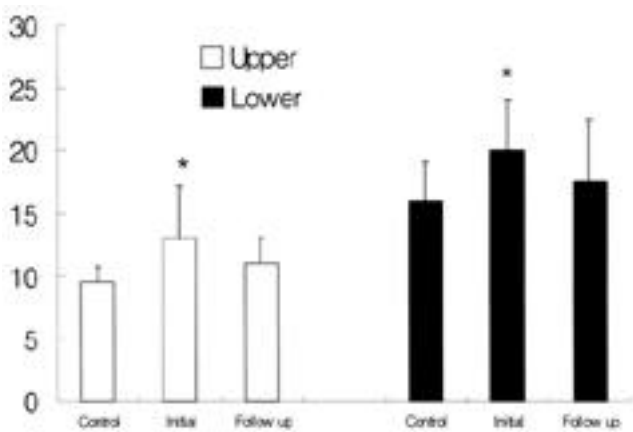


Figure 3. Comparison of central motor conduction time (CMCT) between initial and follow-up MEP studies in the affected side. \* P < 0.05

(fast conductive corticospinal tract)  
 (corticorubrospinal tract),  
 (ventral gray area)  
 가

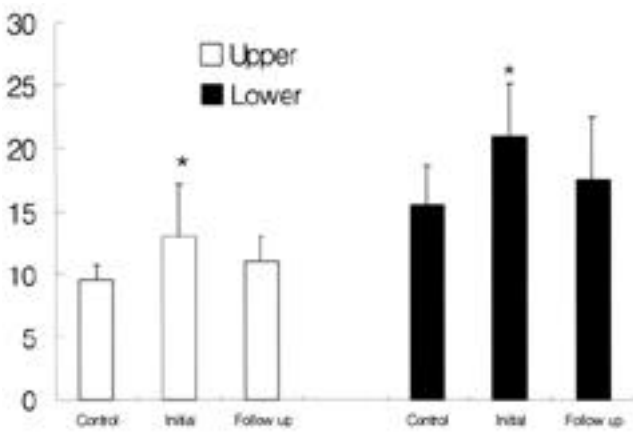


Figure 4. Comparison of central motor conduction time (CMCT) between initial and follow-up MEP studies in the contralateral side of hemiparesis. \* P < 0.05

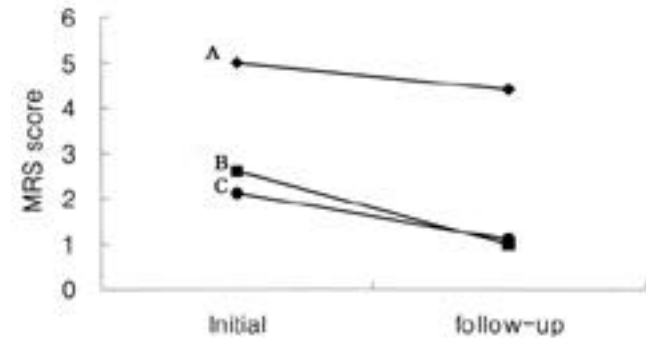


Figure 5. Modified Rankin Scale (MRS) scores changes of initial and follow-up studies in patients. The normal CMCT group was improved in follow-up study (C). The delayed CMCT group was also improved in follow-up study (B), but the group that didn't show MEP response was not improved in follow-up study (A). \* P < 0.05

(large myelinated fiber)  
(temporal dispersion)

Oro <sup>25</sup>

10

6

9

, Jones <sup>19</sup>

5,14

가 <sup>20,21</sup>, Macdonelle <sup>20</sup>  
가

가

, 가 3  
가

가

21

가

가

가

가

21,

22,23,

MRS

가

23

가

24

가

가

가

가

Dominkus <sup>7</sup>

가

MRS

가

가  
Oro <sup>2</sup>

가

가 가 8~13

가

가

(diaschisis) Berardeli

<sup>6</sup> 가

가

20

18

2

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- 가 . ,
- 2 ~ 3 ,
- 가 , ,
- 가 .
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