Cortical plasticity assessed by somatosensory evoked potentials (SEPs) parallels functional recovery of manual dexterity after lesion of primary motor cortex (M1) in monkeys

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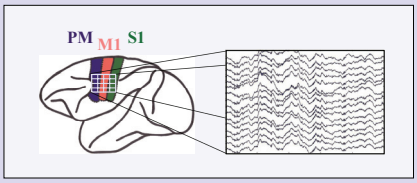
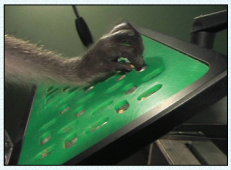
1. INTRODUCTION AND OBJECTIVES

Following unilateral lesion of the hand representation of the motor cortex in monkeys, there is a dramatic loss of manual dexterity of the opposite hand. Later, a progressive functional recovery, though incomplete, takes place, reaching a plateau after about 2 months.



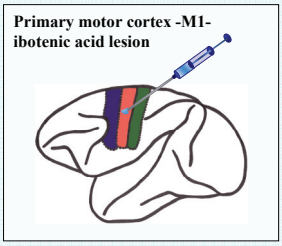
Expecting that the partial functional recovery may depend on plastic mechanisms taking place in the cerebral cortex, ElectroCorticoGraphy (ECoG) was used to monitor the time course of the different components of somatosensory evoked potentials (SEPs). We hypothesize that variation of the SEPs and functional recovery follow a comparable time course.

2. METHODS



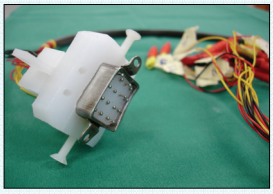
Brinkman board

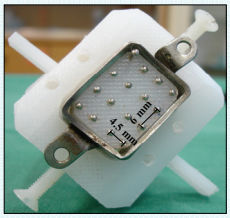
Monkeys were trained to perform a manual prehension task requiring precision grip (modified Brinkman board).
By infusing ibotenic acid, a unilateral lesion was performed in the hand representation of M1.

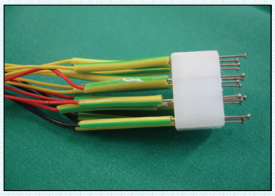


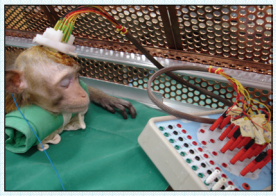
A chronic recording chamber was implanted above PM, M1 and the primary somatosensory cortex (S1).

ECoG was derived from 16 electrodes, placed on the surface of the dura, to monitor the different components of somatosensory evoked potentials (SEPs) during consecutive sessions before the lesion and along the periods of recovery and plateau (days -18 to 199). During the same period, the manual dexterity of the monkeys was assessed.

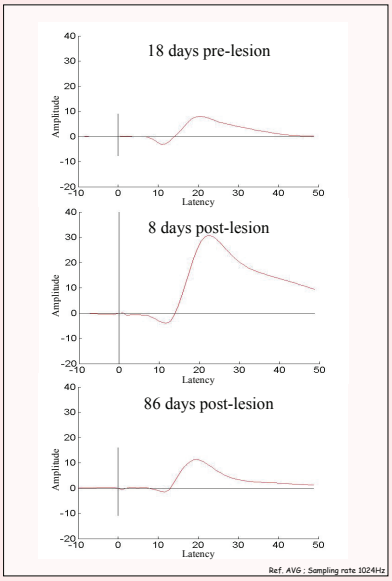






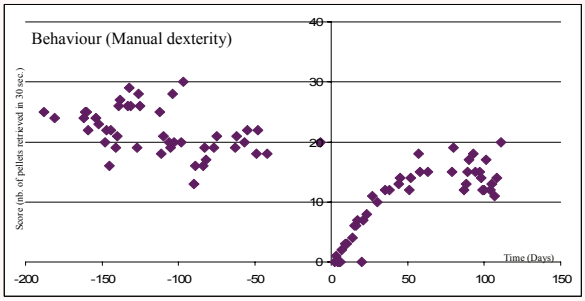


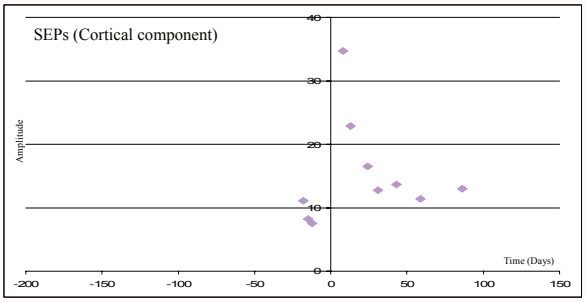
3. RESULTS



Significant changes of SEPs were observed in parallel to the functional recovery.

For instance, the amplitude of the main cortical component of the SEPs transiently increased from post-lesion day 8 to day 60 while, in parallel, the progressive recovery of manual dexterity took place from post-lesion day 7 to day 63.





4. DISCUSSION

The present EcoG method was sensitive enough to discriminate and follow on the long term the different components of SEPs originating from M1 and S1 in a monkey subjected to motor cortex lesion, possibly reflecting cortical plasticity underlying functional recovery.

5. CONCLUSION

We believe that the present fundamental study in the monkey opens new perspectives for a better understanding of plastic mechanisms taking place in human subjects suffering from stroke, both in the acute phase and later on during the recovery, thus representing a tool for a tentative prognostic value of recovery and its time course, possibly predicting the beginning of the plateau.

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