

Normal interhemispheric inhibition in persistent developmental stuttering

Martin Sommer, M.D.; Kathrin Knappmeyer; Evke Jane Hunter; Alexander Wolff von Gudenberg, M.D., Nicole Spindler, Walter Paulus, M.D.

From the Department of Clinical Neurophysiology, University of Goettingen, Germany, and the Institut der Kasseler Stottertherapie, Bad Emstal, Germany

Abstract

Background: Persistent developmental stuttering (PDS) is a frequent speech disorder affecting about 1 % of the postpubertal population, predominantly males. While its origin is far from clear, functional imaging studies suggest a right hemispheric overactivity in patients with PDS, particularly with regard to motor and premotor areas. The *interhemispheric* inhibition studied with transcranial magnetic stimulation is a valuable and established tool to study the interplay of motor areas *in vivo*.

Aims: To explore the *interhemispheric* inhibition in a group of adults with PDS.

Methods: We studied 15 male patient with PDS (average age 26.7 (standard deviation 8.9) years, all but one right-handed with a mean Oldfield handedness score of 72.2 (SD, 39.1) points) and compared the results to 13 male control subjects (26.3 (4.8) years, handedness score 86.5 (23.8) points). Care was taken to exclude patients with cluttering or control subjects with a previous or family history of stuttering or cluttering. We studied the interhemispheric inhibition using (1) a one-coil technique over the hand area of one motor cortex during voluntary activation of the ipsilateral abductor digiti minimi muscle. Here, stimulus intensity was adjusted to yield MEP amplitudes of about 2 mV contralaterally, and the duration of the induced ipsilateral silent period obtained from 30 rectified trials was measured and compared between groups using unpaired, two-tailed t-test. Each side was investigated separately, and the data were analyzed using a repeated-measures ANOVA with

“side” as within- group and “group” as between-group factors. In addition (2), we used a two-coil technique with the conditioning pulse over the hand area of one and the test pulse over the hand area of the other hemisphere while the hand muscles were at rest. The test pulse was adjusted to yield amplitudes of about 1.0 mV, and the conditioned pulse to yield amplitudes of about 1.5 mV. We studied interstimulus intervals of 2, 5, 6, 8, 10, 20, 50, and 80 ms 10 times each, and unconditioned test stimuli 20 times. Here, the amplitude of the motor evoked potential (MEP) recorded in the abductor digiti minimi muscle contralateral to the test pulse was measured and normalized to the unconditioned amplitudes. Each side was investigated separately, and the data were analyzed using a repeated-measures ANOVA with “interstimulus interval” and “side” as within- group and “group” as between-group factors. Results: There was no significant between-group difference for interhemispheric inhibition either in the one-coil design or in the two-coil design.

Conclusion: These data suggest that the interplay between the motor cortices of either hemisphere is normal in patients with PDS. This is consistent with a normal *intracortical* inhibition previously described in PDS patients. The abnormal right motor and premotor activity observed in imaging studies on PDS are not likely to reflect altered primary motor cortex excitability, but are likely to have a different origin.