SNIFFING-RELATED CORTICAL MOTOR POTENTIALS IN ALS – A PRELIMINARY REPORT

M. Korošec, I. Zidar, D. Jeran, B. Koritnik, J. Zidar
Institute of Clinical Neurophysiology, University Medical Centre Ljubljana, Ljubljana, Slovenia

BACKGROUND

Respiratory insufficiency is by far the most frequent cause of death in amyotrophic lateral sclerosis (ALS). Neural control of breathing depends on a central drive to the respiratory muscles. Affection of the latter, which is in clinical setting most difficult to assess in isolation, may contribute to respiratory deficiency in ALS. A possible way to study the central mechanisms for the control of voluntary breathing is through different respiratory manoeuvres, e.g. sniffing and coughing. Movement-related cortical potentials (MRCPs) mainly reflect functioning of the supplementary, premotor and primary motor areas that are involved in sniffing as well.

OBJECTIVE

To determine whether MRCPs evoked by sniffing (sniffing-related cortical potentials – SRCPs) can serve as a useful marker of cortical respiratory drive dysfunction. We hypothesised that SRCP amplitude is reduced in ALS due to neuronal loss. We were also interested if sizes of SRCPs correlate with overall and specific respiratory functional scores and results of pulmonary function tests.

METHODS

Eight patients (48–75 years; 4 with definite and 4 with probable ALS according to El-Escorial criteria) and 10 healthy control subjects (21–26 years) were studied. None of the patients had symptoms or clinical signs of respiratory insufficiency. Both groups performed self-paced sniffing manoeuvre every 5–10 seconds, patients with 20% and controls with 30% of maximal sniff nasal inspiratory pressure. Onset of sniff nasal inspiratory pressure was used for back-averaging of electroencephalogram (10-10 system, 32 electrodes). MRCPs on right index finger flexion was used as a comparison. The maximum amplitudes of SRCPs and MRCPs as well as amplitudes at 500 ms and 100 ms before and at the time of sniff/finger flexion (0 ms) were measured. Grand average was calculated for each task. A three-way mixed ANOVA and Pearson's correlation coefficient were used for statistical analysis.

RESULTS

On grand average, MRCPs and SRCPs of ALS patients were larger compared to controls, but the differences were not statistically significant. No correlation was found between sizes of individual SRCP components' and age, overall and specific respiratory and upper limb subdivisions of Norris and ALS FSRr scores, and results of pulmonary function tests.

CONCLUSIONS

The findings are in contrast with our hypothesis. A tendency toward increased SRCPs and MRCPs may suggest that degeneration of upper and lower motor neurons in ALS is paralleled by processes that compensate for such loss. Plastic changes possibly involve recruitment into the response of additional generator cells within and adjacent to the motor cortical areas that are not called upon in physiologic circumstances (e.g. by reduction of neuronal cell inhibition). The drawbacks of our study are small number of patients that do not include those with clinically overt respiratory dysfunction, large interindividual variability of SRCPs, and non-matched control group.