

The objective of this study was to find correlations between the LC parameter in the alpha band, calculated using the ERD/ERS patterns with the functional state of stroke patients. For this, we analyzed 26 stroke patients who performed 25 sessions of therapy with BCI system. Usually the EEG parameters present high variability, but this is not the case for the LC parameter, as Fig.3 shows.

The LCh in alpha band shows significant correlations with the tremor degree, with the global functionality of the upper extremity and with the sensation part of the FMA. In the other hand, the LCp in alpha band shows a marked correlation with the grasp functionality (Fig. 6.A), with the global motor function in the upper extremity (Fig. 6.B) and the sensation degree (Fig.6.C).

The general rule that can be applied to all these correlations is: LC values near to 0 points are related with high functional degree. LCh values near to 1 and LCp values near to -1 are related with poor functional degree.

The first important result to point out is that our significant results of the LC against the MAS are not similar to the results presented by Kaiser et al. The different kind of stroke patient, or the sample size could explain this.

Another important finding is the correlation with the FMA motor score. The FMA is a very extended scale, used to evaluate the patient's functional state. FMA has been validated many times by many researchers, and the correlations between this scale with EEG features are not common. This correlation is especially interesting because it could mean that the quantification of the cortical activation, using the LC parameter is related to the peripheral motor performance. This relation is present in the affected hemisphere and also in the healthy hemisphere. The healthy hemisphere is not related directly to the motor activity of the paretic side, but for the LC calculation it is necessary using and compare the signals of both hemispheres. This is a reason why the LCh are important values for the assessment of the paretic side. Even though the sample size in our study is too small to give conclusive results, it is worth to point out the significance of this finding.

And last but not least, the LC alpha also presented a strong correlation with the FMA sensation scale part.

The superficial sensitivity and the proprioception are essential players on the BCI systems. The patients should feel as much as possible the feedback that the system provides for a correct closed loop interaction. Only if a correct synchronization between the intention of movement and the real feeling of this movement is provided the motor learning process is optimal [10]. This is only possible with BCI, and this is the greatest limitation of the conventional therapy techniques like the mirror therapy.

The other used scales of this study did not present significant correlations with the LC parameter. Again, the sample size of our study could be a limitation to find such correlations.

Concerning the LC of the beta band, it shows only some

isolated significant correlations with the scales.

Further studies with more patients will be needed to confirm these correlations and to find out how useful the LC parameter is in the daily clinical practice.

CONCLUSION

The results of this study suggest that the LC parameter, calculated using the ERD/ERS of the stroke patients could be related with the Fugl-Meyer Assessment scale. This study opens the door to find more correlations between the EEG parameter with the patient's functional state.

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