The use of automatic classifiers in multifocal electroretinograms recordings for diagnosing multiple sclerosis.

Luis de Santiago[1*], E. López-Guillén[1], E. Vilades[2,3,4], E. Garcia-Martin[2,3,4], Luciano Boquete[1,4]

[1] Department of Electronics, Universidad de Alcalá, Plaza de San Diego, s/n, 28801 Alcalá de Henares (Spain).

[2] Ophthalmology Department, Hospital Universitario Miguel Servet, Zaragoza (Spain)

[3] Aragon Institute for Health Research (IIS Aragon). Innovative and Research Group Miguel Servet Ophthalmology (GIMSO), Universidad de Zaragoza (Spain)

[4] RETICS: Red Temática de Investigación Cooperativa Sanitaria en Enfermedades Oculares Oftared (Spain).

* Main author.

Introduction: The objective of this work is to investigate the diagnostic capacity of multiple sclerosis (MS) in early stages of the disease from the analysis of multifocal electroretinogram (mfERG) recordings using artificial intelligence tools.

Methods: The mfERG signals from both eyes of 10 subjects (F: M = 7: 3) were used with recently diagnosed MS (< 6 months) with no history of optic neuritis and 6 control subjects (F: M = 3: 3). The mean age (SD) was 45.60 (7.38) years for the patients and 35.33 (10.63) years for the controls. The first order mfERG kernel was obtained according to the ISCEV standard using a Roland Retiscan system. The stimulus configuration used was the 61-hexagon array scaled with eccentricity. Parameter P1 latency is defined as the maximum value in the 19 to 50ms interval. The eye is divided in five concentric rings (R1-R5). The latencies of the wave P1 in the rings R2 and R5 are computed and used as inputs to an automatic classifier. The training of the classifier is done with the leave-one-out cross-validation method. The confusion matrix of the classifier is obtained.

Results: Using a cuadratic SVM (Support Vector Machine) as automatic classifier of the latency of P1 wave in the R2 and R5 standard rings in mfERG (leave-one-out cross-validation) the sensitivity is 0.90 and the specificity = 0.58.

Conclusion:

Using an automatic classifier to study mfERG latencies obtains moderate high sensitivity and specificity classifications values. This result suggest that automatic classifiers is applicable for the assessment of patients in the first stages of the multiple sclerosis (without optic neuritis symptoms). In any case, complementary mfERG analysis and processing methods should be investigated to improve the results.