Short Comunications

Clinical and electrophysiological correlation in patient with optic neuritis

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ABSTRACT

A descriptive and traverse study was performed in patients with diagnosis of optic neuritis, that attended to the neuro ophthalmology service of the ophthalmological center, at the Santiago General Hospital "Dr. Juan Bruno Zayas Alfonso ", from the province of Santiago de Cuba, with less than a week of evolution of the disease, and visual acuity greater than 0.3, cooperatives and without refractive opacities, or neuro ophthalmologic diseases, during the period from December 2017 to November 2018. Ophthalmological clinical evaluations and electrophysiological studies of visual evoked potentials to pattern reversal, at diagnosis and eight weeks of evolution were carried out.

Objective: To identify the relationship possible between the electrophysiological parameters obtained by visual evoked potentials with the ophthalmological clinical evaluation.

Results: alterations predominantly of the parameters of latency and duration of the visual evoked potentials, in relation to the impairment of the clinical evaluations explored.

Conclusions: The visual evoked potentials are an effective tool in diagnosis, and complement the clinical evaluation of patients with optic neuritis.

Keywords: optic neuritis; visual evoked potentials; electrophysiological parameters.

INTRODUCTION

Optic neuritis is the most common cause of acute vision loss due to optic nerve disease in adults, representing one of the worst visual prognosis among the ophthalmological diseases; so despite its low percentage among these diseases, it is a health problem.[1,2]

The application of visual evoked potentials in patients with this condition has the advantage of high temporal resolution and objectivity that allow the direct recording of electrical activation of neural networks and its clinical utility is based primarily on the ability to demonstrate functional status and to define the anatomical distribution of the alterations of the visual system.

Despite the number of publications that characterize optic neuritis and the use of electrophysiological studies in its diagnosis, it is still insufficient especially in our province and it is still pending to explore the contribution it could generate in the early diagnosis and follow-up of this entity, as well as the possible relation of the various parameters obtained from the bioelectrical signal, with the different variables of ophthalmological clinical exploration, which will allow a better characterization of the patients.

Due to its repercussion on visual prognosis and in some cases due to the commitment it represents for life, its study acquires a transcendental value for patients suffering from it, so early diagnosis and follow-up by means of visual evoked potentials , in addition to the ophthalmological clinical examination and other auxiliary studies, could establish objective predictors of diagnosis and prognosis of the disease, with the purpose of establishing whether there is a correlation between the results of the ophthalmological clinical evaluation with the electrophysiological parameters obtained from the evoked potentials Visuals in patients with optic neuritis.

METHODS

A descriptive and cross-sectional study was performed in patients with a diagnosis of optic neuritis who we retreated in the neuro ophthalmology department and the Department of visual electrophysiology of the Santiago General Hospital "Dr. Juan Bruno Zayas Alfonso "from the province of Santiago de Cuba, who fulfilled the following criteria: diagnosis of optic neuritis less than one week of evolution of the disease, with better corrected visual acuity higher than 0.3, without opacities of the refractive media (cataracts, uveitis), or neuro ophthalmologic diseases; accepted to voluntarily form part of the study during the period from December 2017 to November 2018.

The patients underwent a clinical examination that included visual acuity, color vision, papillary reflexes, ocular tension, ocular motility, primary gaze position (Hirschberg), cover test, visual field and visual evoked potentials to pattern with space frequency of 60 minutes and total luminance of 80 cd / m². A monocular record in the occipital canal was obtained by using Au

surface electrodes. The active electrode was placed on the occipital region (Oz), the reference electrode on the frontal region (Fz) and the earth electrode on the right or left mastoid. A 21-inch CRT monitor was used as a "checkboard" pattern stimulus generator, with full field, with fixation element size: 10; a meter and a half away. The signal was filtered between 0.5 and 100 Hz, with gain of 100 000 in all leads and Sensitivity: 5 µV / div. Averages: 100 responses using 2 Hz stimulation frequency and 300 ms analysis time, with 3 replications.

The data was presented in tables and graphs. The possible correlation was measured through Pearson's linear correlation coefficient to establish the relationships between the electrophysiological parameters and the clinical evaluation (visual acuity and color vision).

RESULTS

Visual acuity is the ability to accurately discriminate the details of objects in the visual field and is usually one of the main clinical symptoms to be affected in patients with optic neuritis.

It is evident in Table 1 that all patients have impairment of visual acuity at diagnosis, with moderate involvement predominating in 16 patients, representing 80%; which is characteristic of the disease, appreciating that to the extent that visual acuity is lost, there is a proportional increase in latency and duration above normal values, while the amplitude shows a tendency to decrease, but without being below normal values.

Table1. Results of the main components of the VEP according to initial visual acuity

Visual acuity (Initial)	Latency P 100 (ms)		Duration (ms)		Amplitude (uv)	
	X	DS	X	DS	X	DS
Mild(n=4)	127	2.82	98.3	2.4	17.3	2.4
Moderate(n=16)	136.7	9.05	112.5	7.43	7.43	4.69

p=0.10 p= 0.01 p=0.03

Source: PEV registry of the Department of visual electrophysiology. General Hospital Santiago "Dr. Juan Bruno Zayas Alfonso"

The increase in latency showed a significant inverse relationship (p = 0.10) as well as the duration (p = 0.01) with the affectation of visual acuity; On the other hand, the tendency to decrease in amplitude, although the values were not below the normative values, showed a significant direct relationship, which shows that as the visual acuity diminishes, the amplitude in the patients is reduced.

The visual field is the portion of space in which objects are viewed simultaneously while the gaze is fixed at one point and is usually affected in patients with optic neuritis. Table 2 shows the relationship of the initial visual field and the main components of the visual evoked potential; it is observed that moderate affectation of the visual field predominated in 10 patients, which represented 50%, only 6 patients of the total presented a slight affectation when doing the *campimetric* evaluation. The increase in latency and duration is evident in an abnormal and proportional way as the visual field deteriorates. On the other hand, the amplitude showed a non-proportional or homogeneous tendency as its values decreased, as the visual field was altered, but without falling below the normal values.

Table2. Results of the main components of the VEP according to initial visual field

Visual field (Initial)	Latency P 100 (ms)		Duration (ms)		Amplitude (uv)	
	X	DS	X	DS	X	DS
Mild (n=6)	128.6	3.5	102	7.41	17.03	0.7
Moderate (n=10)	135.2	10.5	113.5	8.02	8.33	2.83
Severe (n=4)	143.0	4.2	114.7	10.67	11.5	5.37

Source: PEV registry of the Department of visual electrophysiology. General Hospital Santiago "Dr. Juan Bruno Zayas Alfonso"

All the patients were subjected to the same diagnostic and therapeutic protocol and were evaluated electrophysiological and clinically at the beginning and at the term of 8 weeks, and an evolution was performed base on the evolution of the clinical ophthalmological variables analyzed.

Table 3 shows the relationship between clinical evolution and the main components of visual evoked potential. It was observed that 8 patients presented a good recovery and 8 of them presented a regular recovery, which means that 80% of the patients, overall, showed improvement. Only 4 patients of the total did not show an adequate recovery in the evaluation performed at 8 weeks and was generated in those who presented a worse clinical condition at diagnosis.

Table 3. Results of the main components of the VEP according to clinical evolution

Clinical evolution (8 weeks)	Latency P 100 (ms)		Duration (ms)		Amplitude (uv)	
	X	DS	X	DS	X	DS
Good (n=8)	129	2.9	105.6	8.8	15.2	3.6
Regular (n=8)	136.5	11.6	103.2	9.2	5.95	2.6
Bad (n=4)	143	4.2	110.75	10.6	11.5	5.3

Source: PEV registry of the Department of visual electrophysiology. General Hospital Santiago "Dr. Juan Bruno Zayas Alfonso"

The prolongation of the latency in proportional relation to the affectation of the clinical evolution was evidenced, duration showed a similar but not proportional behavior. On the other hand, the amplitude showed normal values, although with a tendency to decrease as the clinical evolution was altered, although this tendency was not shown in a proportional way.

The latency of the P100 component constituted the electrophysiological parameter, as in the other preceding relationships, which most relates its proportional increase, with the degree of deterioration in the clinical evolution.

DISCUSSION

Visual acuity is the ability to accurately discriminate the details of objects in the visual field. The increase in latency in inverse relation to the decrease in visual acuity could be explained by the involvement of the optic nerve. Since greater myelin damage is involved with the genesis of the disease, latency and duration are usually more affected; what is related to the pathophysiology of these diseases, where the myelin sheaths are frequently more affected than the number of functional fibers or axons, which coincides with the data reported by Abouzeid, Bhatti and other researchers.[3-5]

This phenomenon could also be related to the early diagnosis of the patients included in the study, since there is sufficient evidence of more severe damage of the optic nerve in patients with late diagnosis or inadequate management, where the amplitude could be more compromised, which is expression of coexisting axonal damage.[5-8]

Campimetric alteration shave been reported as one of the main clinical features in patients with optic neuritis.[9,10] The increase shown in latency and duration above normal values suggests a direct relationship between the latency affectation of the P100 component and the duration of the visual evoked potential with the degree of visual field deterioration in the initial phases of the

disease and could be established as an electrophysiological marker to evaluate uncooperative patients with optic neuritis.

Whereas the responses of the VEP depend to a large extent on the central visual function, mainly because the macular representation in the cortex is disproportionately large and also because the central fibers project posteriorly in the occipital pole, close to the active electrode of registration; the reason for a greater central alteration of the visual field is explained, the electrophysiological parameters are significantly altered.

When considering the relationship between the clinical evolution and the main components of the visual evoked potential, we found that the latency of the P100 component constituted the electrophysiological parameter, as in the other preceding relationships, which most relates its proportional increase, with the degree of deterioration in the clinical evolution; therefore, it could be established as an electrophysiological marker, not only of the clinical evolution of the patient, but even as an indicator that a patient has suffered a previous asymptomatic episode of optic neuritis. The latter behaves in a manner similar to that described by several authors, based on the fact that the alteration of the visual potential is a probable indicator of a previous involvement of the optic nerve in patients without evident clinical manifestations and negative pathological antecedents.[11,12]

In this sense, what is most significant is that even in patients with normal clinical evaluation, altered values were observed in the parameters analyzed, which is an expression of the subclinical damage that persists in their visual pathways, regardless of whether the clinical evaluations are normal, coinciding with the criteria proposed by Rodriguez Mena and colleagues, as well as by another group of researchers[11,12] and, which demonstrates the great value of visual electrophysiology, not only in the diagnosis, but in the follow-up of patients with optic neuritis; at the same time that could allow us to readjust the treatment and individualize the protocol, to obtain an optimal recovery of the optic nerve and a more favorable visual prognosis.

CONCLUSIONS

The electrophysiological parameters that are most modified in relation to the clinical ophthalmological evaluation are the latency and the duration, expression of the myelin damage in the optic nerve, constituting the visual evoked potentials an effective tool in the diagnosis and follow-up, which complements and relates the clinic evaluation of patients with optic neuritis.

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