Scripta Scientifica Medica, vol. 32 (2000), pp 41–43

INVESTIGATION OF VISUAL ASSESSMENT OF ALTERNATING LUMINOUS AREAS IN NEUROOPHTHALMOLOGICAL DIAGNOSIS OF PATIENTS WITH INTRA - AND PARASELLAR TUMORS

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ABSTRACT

The method for investigation of visual assessment of alternating luminous areas (VAALA) enables to establish visual disorders in different diffusive and local brain lesions including brain tumours. In this study the applicability of VAALA in the complex neuroophtalmological investigations in patients with intra- and parasellar tumours was analyzed. VAALA, peripheral vision, and visual acuity were assessed in 9 patients with extrasellar tumours and in 5 patients with intrasellar ones. VAALA showed changes in all the patients without any significant difference between both patients' groups. Routine neuroophthalmological examination even in patients with extrasellar tumours indicated some typical abnormalities in a part of the cases only while in single cases of intrasellar tumours only initial changes could be detected. Perimetria and especially visual acuity and VEP possessed a lower diagnostic value in perichiasmatic lesions than contemporary psychophysical tests, VAALA inclusive. The high sensitivity of VAALA concerning the visual disturbances in pathological processes in these areas enables its integration into the complex neuroophthalmological examination.

Key words: visual functions, alternating luminous areas, sellar tumours, parasellar tumours, neuroophthalmology, psychophysics

INTRODUCTION

The psychophysical method for investigation of the visual assessment of alternating luminous areas (VAALA) gives opportunity to establish visual disorders in different diffusive and local brain lesions including brain tumours. Previous studies failed to prove any correlation between the changes in VAALA and the site and location of the pathological process (1,3,6).

The analysis of the visual phenomenon studied by this psychophysical method makes possible to accept a similarity with the mechanisms responsible for the contrast sensitivity (2,8).

The latter is considered to be a method providing a new understanding in discussions about the visual disorders rather than a component in the set of routine neuroophthalmological study. Its early impairment has been proved in both intra- and parasellar tumors (4,5,7). The neuroophthalmological study of processes in these regions known to provide a typical information about peripheral (bitemporal hemianopsia) and central vision (reduction of visual acuity) abnormalities, mainly in tumors with extrasellar growth, does not include a contrast sensitivity testing, an expensive and especially experimental method.

The purpose of the study is to analyze the applicability of VAALA in the complex of the neuroophthalmological investigations in patients with intra- and parasellar tumors.

MATERIAL AND METHODS

Nine patients (mean age of 47,44 years) with parasellar and five ones (mean age of 46 years) with intrasellar tumour location were examined in the Department of Neurology of the University Hospital at the Medical University of Varna. The clinical diagnosis was verified by means of CT, surgery and pathohistology. Patients' distribution according to their sex, age, tumour histological type and location was summarized on Table 1.

1. Method of VAALA

To investigate VAALA, a unique "Lumitest analyzer" apparatus was used which provided conditions for the gradual elevation of the central field brightness, visualizing in this way a darkening on the background with a constant brightness. Thirty conditional digital answers were registered in two-eye vision. The mathematical expectation (ME) was calculated by mathematical analysis of the results with statistical reliability at $p = 0,05$. The hypothesis of any signifi-

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cant differences within the ME was confirmed or rejected using the *t*-criterion. The analysis of the results was based on the reference value of ME = 35,4 calculated by testing the healthy individuals under the same conditions.

2. Neuroophthalmological examination

a) assessment of visual acuity by tables with Snellen`s optotypes;
b) assessment of peripheral vision - Golden`s perimetria ;
c) assessment of visual evoked potentials (VEP) - "flash" evoked potentials.

Table 1. Patients' distribution according to sex, age, histological type and location of the tumour

Patient No.	Sex		Age	Sellar location		Histological type
	M	F		Intra-	Extra-	
397		+	63	+	+	mezoadenoma
239		+	34	+	+	mezoadenoma
225		+	51		+	meningioma
299		+	67		+	meningioma
233	+		36	+	+	craniopharingioma
341	+		42	+	+	adenoma
321	+		24	+	+	adenoma
192		+	59	+	+	adenoma
59	+		51		+	adenoma
154	+		23	+		adenoma
344		+	51	+		adenoma
274	+		63	+		adenoma
308		+	45	+		adenoma
173	+		48	+		adenoma

RESULTS AND DISCUSSION

The values of ME, based on the mathematical analysis of the investigated VAALA and the results of the neuroophthalmological examination (visual acuity, perimetria and VEP) are presented on Table 2.

ME values in all the patients are in the interval between 40,733 and 47,233 at a reference range of 35,40. In patients with intrasellar tumors they are from 41,764 to 44,29 while in cases with extrasellar ones – from 40,733 to 47,233.

Seven patients with extrasellar tumors have bitemporal hemianopsia while among the patients with intrasellar tumors only one has initial changes in the peripheral vision (bitemporal hemianopsia with lower predominantly left quadtrantanopsia).

VEPs are abnormal in one patient with intrasellar tumour and in 5 with extrasellar ones.

Visual acuity is insignificantly one-eye reduced in one of the patients with intrasellar tumors while in cases with extrasellar lesions it is reduced bilaterally in 3 patients, unilaterally - in 3 and is normal in 3.

Table 2. ME values and neuroophthalmological findings

Patient No.	ME	Perimetria	Visual acuity	VEP
397	40,73	Bitemporal hemianopsia	VOD = 0,2 VOS = 0,7	P-100 elong. ampl.-left
239	47,64	Bitemporal hemianopsia	VOD = 1,0 VOS = 1,0	normal
225	42,29	Bitemporal hemianopsia OS >	VOD = 0,9 VOS = 0,9	Normal
299	47,23	Bitemporal hemianopsia	VOD = 0,6 VOS = 0,9	P-100 elong. – right
233	43,56	Bitemporal hemianopsia	VOD = 1,0 VOS = 0,1	P-100 depriv.- right
341	45,23	Normal	VOD = 1,0 VOS = 1,0	Normal
321	43,88	Normal	VOD= 1,0 VOS = 1,0	Normal
192	47,03	Bitemporal hemianopsia	VOD = 0,8 VOS = 1,0	P-100 elong. – right
59	42,03	Bitemporal hemianopsia OD >	VOD = 0,6 VOS = 1,0	P-100 elong. – right
154	43,23	Normal	VOD = 1,0 VOS = 0.8	Normal
344	44,28	Normal	VOD= 1,0 VOS = 1,0	Normal
274	41,76	Normal	VOD= 1.0 VOS = 1.0	P-100 elong. Bilater
308	44,29	Bitemporal low quadrant hemianopsia OS >	VOD= 1.0 VOS = 1.0	Normal
173	43,29	Normal	VOD= 1.0 VOS = 1.0	Normal

The neuroophthalmological examination in patients with extrasellar tumours points out characteristic deviations only in one part of the cases while in patients with intrasellar tumors only one has initial changes concerning peripheral vision, visual acuity, and VEP. That is why perimetria and es-

pecially visual acuity and VEP are less demonstrative than other modern tests (contrast sensitivity) when examining visual impairments in parasellar regions (4).

VAALA is changed in all the patients with intra- and extrasellar tumours; a fact that correlates to the previously reported results concerning patients with differently located brain tumours (1,3,6). Actually, in the present study, a lack of significant difference in ME between both groups (with intra- and parasellar tumours) is established. These facts provide reasons to accept a lack of correlation with the anatomical relations (tumour size and its situation to the chiasm) and the tumour type (adenoma, meningioma). The last conclusion suggests the influence of other factors, except the chiasm compression, provoking the appearance of visual abnormalities in these cases.

CONCLUSION

The disturbance of VAALA such as impaired contrast sensitivity could be interpreted as an early sign of visual disorders in patients with intrasellar tumours.

Accordingly, VAALA testing could be a good index for the investigation of the visual disorders in these cases, furthermore the presented psychophysical method with its accuracy and relatively easy presentation is available and suitable for multiple and screening studies of large contingents.

All of this gives a reason to include the method of VAALA in the complex of neuroophthalmological examinations of patients with intra- and parasellar tumours.

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