ORIGINAL ARTICLE

Morphologic differences of occipital region in patients with schizophrenia and migraine headache using magnetic resonance imaging (MRI) and visual evoked potentials (VEPs)

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ABSTRACT

Aim To compare morphologic variations of occipital sulci patterns in patients with schizophrenia and migraine headache regarding gender and laterality using magnetic resonance imaging (MRI) and visual evoked potentials (VEPs) as well as damage of visual pathway in patients with schizophrenia.

Methods This study included 80 patients. Brain scans and visual evoked potential responses recorded over the occipital cortex were performed to analyze the occipital region of both hemispheres. Average total volumes of both hemispheres and average values of latency of the healthy population were used for comparison.

Results There was statistically significant difference between subjects considering gender (p=0.012). Parameters of body of the calcarine sulcus (p=0.0325) showed statistically significant positive correlation with P100 latency (p=0.0449), inferior sagittal sulcus (p=0.0443) had significant positive correlation with P100 latency (p=0,0413), lateral occipital sulcus (p=0.0411) and P100 latency (p=0.0321) showed statistically significant difference only of left hemisphere in male patients with schizophrenia with shallower depth of the sulcus and P100 latency prolongation.

Conclusion The consistency of the findings reveals distinct multiple brain regions, which show changes in the gray matter of patients with chronic forms of schizophrenia. The neurocognitive deficits of schizophrenia show highly consistent cross-sectional relationships to each type of functional outcome.

Keywords: neuropathology, neuroradiology, neurophysiology, visual pathway

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INTRODUCTION

Schizophrenia is a debilitating, serious medical disorder and it has been hypothesized that the disorder originates from brain neurodevelopmental neuropathology with symptoms and neuropsychological deficits arising from alterations in brain regions or functional neuronal circuits (1). In contrast, neuropathological process may be related to a pre-existing neurodevelopmental loss of synaptic contacts as well as, in subgroups of patients, to ongoing deficits on the synaptic and molecular level, resulting in an excessive loss of neuronal connectivity. Schizophrenia is not a classical neurodegenerative disorder with astrogliosis, neuronal loss and an increment of cognitive deficits during its course. On the functional level, deficits are evident in symptom dimensions, a subtle loss of volumes in specific brain regions, and in the activation pattern of neuronal networks (2). The disturbed function is related to decreased macro-and micro connectivity with disturbed connections in neuronal networks and a deficit on the synaptic level. Imaging studies suggest that the subtle morphological correlates of schizophrenia outlined above sit beside localized alterations in the morphology and molecular composition of specific neuronal, synaptic and glial populations in the hippocampus, dorsolateral prefrontal cortex and dorsal thalamus. These findings suggest a view of schizophrenia not only as a disorder of connectivity, but also of the synapse. While cognitive dysfunction, including memory and attentional deficits, are well known in schizophrenia, recent work has also shown basic sensory processing deficits. Deficits are particularly prominent in the visual system and may be related to cognitive deficits and outcome (3). A primary approach to analyzing integrity of visual processing is the use of visual evoked potentials (VEPs). The VEPs have the advantage that they are nonbehavioral and so provide an objective measure of brain function.

Visual evoked potentials (VEPs) abnormalities have been a fairly consistent finding in patients with schizophrenia, and these highlight the importance of sensory processing deficits, in addition to higher cognitive dysfunction, for understanding the pathophysiology of schizophrenia (4). Understanding the nature of sensory processing deficits may provide insight into mechanisms of pathology in schizophrenia, impaired signal amplification, and could lead to treatment strategies including sensory processing rehabilitation that may improve outcome (5).

The VEPs provide an objective measure of brain function, analyzing integrity of visual processing. Results from behavioral and electrophysiological studies support early visual processing dysfunction in schizophrenia, with preferential deficits being found in the magnocellular pathway, though parvocellular deficits have been found as well (6).

Preferential magnocellular dysfunction may provide a substrate for dorsal stream dysfunction as well as higher level cognition deficits and outcome (7).

The aim of the study was to determine the morphologic differences in the brain structures of occipital region regarding laterality and P100 latency between patients (in the Clinical Center of the University of Sarajevo, in three different clinical departments) with schizophrenia and patients with migraine headache using MRI and VEPs. Structural deficits in occipital cortex, particularly in optic radiations, and their relationship to early visual processing deficits, document the importance of subcortical as well as cortical dysfunction in schizophrenia. These findings may provide understanding of the nature of sensory processing deficits and pathophysiology of schizophrenia.

PATIENTS AND METHODS

Patients and study design

This prospective, comparative study had been conducted at the Department of Psychiatry and Department of Neurology, Clinical Center of the University of Sarajevo, during the period of four years (2011-2015). The study included 80 patients of both sexes, 21–67 years old, classified into two groups: S group included 40 patients with schizophrenia (21 males and 19 females) and M (control) group with 40 patients with migraine headache (10 males and 30 females).

Magnetic resonance imaging (MRI) scans of both the left and the right hemispheres of occipital lobe of 80 human brains were examined at the Department of Radiology, Clinical Center of the University of Sarajevo. Coronal sections and descriptive analysis of the occipital lobe were performed of parieto-occipital fissure, temporo-occipital incisure, body of the calcarine sulcus,

anterior sulcus calcarinus, retrocalcarine sulcus, inferior sagittal sulcus, transverse occipital sulcus, lateral occipital sulcus, inferior occipital sulcus of occipital lobe, left and right hemispheres of both groups according to gender. The sulci (regions) of interest of the occipital lobe through the magnetic resonance imaging volume of a single patient (control and patient with schizophrena) were identified (ROI): parieto-occipital fissure (POF), temporo-occipital incisure (TO), body of the calcarine sulcus (BCS), anterior sulcus calcarinus (ACS), retrocalcarine sulcus (RCS), inferior sagittal sulcus (ISGS), transverse occipital sulcus (TOS), lateral occipital sulcus (LOS), inferior occipital sulcus (IOS).

Visual Evoked Potentiasl (VEPs), as a measurement of the electrical signal, recorded at the scalp over the occipital cortex of 80 human brains in response to light stimulus, were examined at the Department of Neurology, Clinical Center of the University of Sarajevo.

The VEPs were used primarily to measure the functional integrity of the visual pathways from retina via optic nerves to the visual cortex of the brain. Visually evoked potentials elicited by flash stimuli can be recorded from many scalp locations in humans.

Visual stimuli stimulate both primary visual cortices and secondary areas. Clinical VEPs are usually recorded from occipital scalp overlying the calcarine fissure. This is the closest location to primary visual cortex (Brodmann's area 17).

The Ethics Committee of the University Clinical Center Sarajevo gave an ethical consent to perform the study. All subjects signed a written informed consent for the use of the results obtained for publication before the enrollment.

Patients (S group) included in the study were 18 to 67 years old, who were on the hospital treatment and under antipsychotic drugs at the Department of Psychiatry, and had been diagnosed with schizophrenia according to the ICD-10 criteria (8). Patients were included into the research on the basis of consecutive admissions, taking into account that all of them were with a long psychiatric history (at least 5 years of hospital treatment) with signed information consent within clinical research. The criteria for the exclusion referred to the appearance of psychotic phenomenology within neurological disease, organic psychosyndrome, somatic disease, neurological disorder (head trauma, brain insult, epilepsy), information on drug or alcohol abuse, metal content in the body or those who did not sign informed consents for voluntary participation.

For the group of patients with schizophrenia, the average age was 41.50 (SD±10.44; range 22–67) years.

The control group (M group) represented patients 18 to 55 years old, based on admissions at the Department of Neurology, diagnosed with migraine headache criteria (9), and were tested with the test scales of assessment with the signed informed consent for voluntary participation. This group included subjects who had never suffered from psychotic or severe neurological disorders (head injuries, epilepsy) or diseases, and in whose anamnesis there was no information on drug or alcohol abuse, with no metal content in the body and who signed informed consent for voluntary participation.

The average age of the control group was 38.50 (SD±6.59; range 30–53) years. The groups were equal according to age (p=0.691).

Methods

Neuroradiology method - magnetic resonance imaging (MRI). MRI scans were performed on a Siemens 3T supraconducting magnet system to get a very strong and homogeneous field T2TSE3D-RST-TRA (Avanto, Siemens, Erlangen, Germany). It applied the relaxation time T2 (TR=750/TE114) with sequences of turbo spin echo (TSE) in transverse planes and layer thickness of 0.6 mm, T1 sequence (voxel resolution: 1mm×1mm×1.25mm, TI:20ms, TD:500ms, TR:9.7ms, TE:4.0ms, FLIP:10, Matrix:256×256, Rect. FOV: 7/8, Partitions:128, Time=13 min and 12 seconds). For the purpose of a group analysis sulcus depth (mm), t-statistical map was generated for each hemisphere by application of $t>2.66$ ($p<0.01$, with the rate of freedom of 61). Two statistical methods, group analysis of size and interhemispheric symmetry were used to test significant differences of sulcus depth between groups. Volumes of the sulcal patterns of the occipital region (cc) of both left and right hemispheres for each patient were investigated to provide a quantitative description of the variability of the location of a given brain structure.

Anatomical variability of the sulci of the occipital region in standard stereotaxic space in the form of probability maps was examined. The image data were resampled onto a standard grid with cubical voxels 1 mm wide. The gray-matter voxels extending for 1 mm on either side of the banks of the sulcus were included in the set of voxels constituting the sulcus. We identified occipital sulci and marked their corresponding gray matter voxel on magnetic resonance images around POF, TO, BCS, ACS, RCS, ISGS, SSGS, TOS, LOS, IOS, PCS, LiS and LuS. Average total volumes (cubic centimeters, cc) of both the left and the right hemispheres of the healthy population for the comparison were as follows POF 24.0, TO-1.1, BCS 11.2, ACS 7.5, RCS 2.7, ISGS 1.9, SSGS 1.8, TOS 7.2, LOS 5.8, IOS 1.9, PCS 3.8, LiS 1.7, LuS 2.5 (13,14).

Neurophysiological method -Visual evoked potentials (VEPs). Patients were subjected to examination by Visual evoked potentials (VEPs) and patterns for psychophysical and electrophysiological experiments were generated using a Medelec Synergy, Version 10.1 (Oxford Instruments Medical, United Kingdom), applying a unipolar montage technique where reference electrode (surface gold electrode) was placed 5 - 9 cm above the nasion point on the sagittal line between the nasion and Cz point, the active electrode was placed 2 - 4 cm above the posterior external protuberance on the line between the latter and Cz, while the ground surface electrode was placed on the chin to reduce artifacts. The pattern used was alternate pattern, each evoked potential recorded right and left eyes was recorded and processed, then the evoked potential was recorded from both eyes, and processed to calculate P100 latency. Recording was repeated 3 times for each patient and the mean was taken for recordings measured for each patient to minimize recording artifacts.

For all experimental runs, the stimulus consisted of a checkerboard pattern with equal numbers of light and dark checks (16 black and 16 white, size 2x2 cm). Luminance was 50 cd/m^2, Michelson contrast = 80%. Each check subtended a visual angle of 0.65° both horizontally and vertically, while the checkerboard as a whole subtended visual angles of 5.25° vertically and horizontally. In all experimental runs the checkerboard was presented in the center of a monitor with a gray background. Visual-evoked potentials were recorded from the occipital site relative to the vertex site reference by means of gold-cup electrodes placed on the midline of the scalp. The ground was placed at the parietal site. Visually evoked potentials elicited by flash stimuli can be recorded from many scalp locations in humans. Visual stimuli stimulate both primary visual cortices and secondary areas. Clinical VEPs is usually recorded from occipital scalp overlying the calcarine fissure. This is the closest location to primary visual cortex (Brodmann's area 17).

A common system for placing electrodes is the "10-20 International System" which is based on measurements of head size (10). The mid-occipital electrode location (OZ) was on the midline. The distance above the inion calculated as 10% of the distance between the inion and nasion, which is 3-4 cm in most adults (the inion is the most prominent projection of the occipital bone at the posteroinferior part of the skull) (lower rear). Lateral occipital electrodes are at similar distance off the midline. Another set of locations was the "Queen Square system" in which the mid-occipital electrode is placed 5 cm above the inion on the midline and 5 cm lateral from that location for lateral occipital electrodes (11).

There is a prominent negative component at peak time of about 75 msec (N75), a larger amplitude positive component at about 100 msec (P100) and a more variable negative component at about 145 msec (N145). The major component of the VEPs are the large positive wave peaking at about 100 milliseconds. The VEsP waveform, amplitudes and peak times depend upon the parameters of the stimulus. Steady state VEPs are those recorded using stimulation rates of 3 or more per second.

Transient VEPs were recorded using rates of less than 3 per second. For all experimental runs, the stimulus consisted of a checkerboard pattern with equal numbers of light and dark checks. Each check subtended a visual angle of 0.65° both horizontally and vertically, while the checkerboard as a whole subtended visual angles of 5.25° vertically and horizontally. In all experimental runs the checkerboard was presented in the center of a monitor with a gray background. The stimulation of the entire field of view with both eyes, then the whole field of view individually for left

and right and for the halves of the visual fields of both eyes. Eye that was not watching was covered. Average values of latency (the entire eye field both eyes) of the healthy population for the comparison were as follows- P100 latency (ms) entire field of view (both eyes) 96.60, left eye: 96.60, right eye 99.30, right field of view (left eye) 103.50, right eye 103.50, left field of view (left eye) 105.00, right eye 105.00.

Statistical analysis

The research task was to define the differences between patients with schizophrenia and patients with migraine headache according to morphology of the brain regions using MRI and VEPs of both groups. For the purposes of correlation and associative analysis multivariate analysis of variance, Pearson's correlation coefficient and Point-biserial correlation was applied using χ^2 test, T-test of independent samples, T-test of paired samples, Kolmogorov-Smirnov test and Levene`s test for equality of variances

Differences in which the p value was less than 0.05 ($p<0.05$) were considered statistically significant.

RESULTS

The study was conducted on a group of 80 subjects divided into two groups: patients with schizophrenia (40) and control group (40) with migraine headache.

Among 40 patients with schizophrenia 21 (52.5%) were males and 19 (47.5%) females; in the control group 10 (25.0%) patients were males and 30 (75.0%) females (p=0.012).

Average age of patients with schizophrenia was 41.50±10.43 years, and of controls 38.50±9.48 years (Table 1).

Table 1. Age distribution of patients

	No (%) of patients			
	Schizophrenia group		Control group	
Age (years)	Male	Female	Male	Female
20-30	5 (23.8)	1 (5.3)	4 (0.4)	6 (0.2)
30-40	8 (38.1)	5 (26.3)	1 (0.1)	12 (0.4)
40-50	5 (23.8)	8 (42.1)	3 (0.3)	9 (0.3)
50-60	2 (9.5)	4 (21.1)	2 (0.2)	3 (0.1)
60-70	1 (4.8)	1 (5.3)	/	/
Total	21	19	10	30

The morphological variation of the sulci of the occipital region and P100 latency of the human brain was examined in 80 patients (patients with schizophrenia and controls) using magnetic resonance imaging and visual evoked potentials. Significant differences between the groups were registered of occipital lobe with some specific regions (left hemisphere) and P100 latency (left side) only in male patients with schizophrenia.

Patterns of body of the calcarine sulcus (m=9.713; SD=4.530; p=0.0213) showed statistically significant positive correlation with P100 latency (m=97.155; SD=10.064; p=0.0449) regarding gender only in male patients with schizophrenia only on the left side, without differences on the right side in the same group based on parameters of MRI (m=10.218; SD=5.977), and VEP analysis (m=97.590; SD=9.804) (Table 2).

In parameters of inferior sagittal sulcus (m=1.730; SD=1.656; p=0.0443) regarding gender statistically significant positive correlation with P100 latency (m=102.900; SD=10.830; p=0.0413) was noticed only on the left side in male patients with schizophrenia without differences on the right based on parameters of MRI (m=1.490; SD=0.909), and VEP analysis (m=102.858; SD=10.468) (Table 2). Statistically significant positive correlation in parameters of lateral occipital sulcus (m=5.545; SD=4.467; p=0.0411), and P100 latency (m=99.180; SD=10.387; p=0.0321) regarding gender was noted only in male patients with schizophrenia, with no differences on the right side of those patients based on parameters of MRI (m=4.640; SD=4.326) and VEP analysis (m=99.955; SD=9.886) (Table 2).

Table 2. Morphologic structures of occipital lobe and P100 latency according to gender

Group of patient / variables	Mean (m) of a population	SD (standard deviation)	p
Schizophrenia			
Body of the calcarine sulcus	9.713	33.411	0.0213
(BCS)- left (male)	97.155	10.063	0.0449
Control			
Body of the calcarine sulcus	10.218	5.977	
(BCS) –right (male)	97.590	9.804	
Schizophrenia			
Inferior sagittal sulcus	1.730	1.656	0.0443
(ISGS)–left (male)	102.900	10.830	0.0413
Control			
Inferior sagittal sulcus	1.490	5.977	
(ISGS) –right (male)	97.590	9.804	
Schizophrenia			
Lateral occipital sulcus	5.545	4.467	0.0411
(LOS)–left (male)	99.180	10.387	0.0321
Control			
Lateral occipital sulcus	4.640	4.326	
(LOS)-right (male)	99.955	9.886	

Table 3. Correlation of P100 latency with magnetic resonance imaging (MRI)

	Group of patients/variables	Body of the calcarine sulcus (BCS) – left male	p	Inferior sagittal sulcus (ISGS) – left male	p	Lateral occipital sulcus (LOS) – left male	p
Schizophrenia	P100 latency (ms) whole view field-both eyes	0.325*		0.273		0.342*	
	P100 latency (ms) whole view field-left eye (mean)	0.413* (97.16)	0.045	0.287		0.364*	
	P100 latency (ms) whole view field-right eye	0.357*		0.328*		0.403*	
	P100 latency (ms) right view field- left eye (mean)	0.292		0.229 (102.90)	0.041	0.310	
	P100 latency (ms) right view field- right eye	0.251		0.280		0.313*	
	P100 latency (ms) left view field-left eye (mean)	0.336*		0.355*		0.519* (99.180)	0.0321
	P100 latency (ms) left view field-right eye	0.279		0.308		0.484*	
Control	P100 latency (ms) whole view field-both eyes	0-.116		-0.345*		-0.356*	
	P100 latency (ms) whole view field-left eye (mean)	0.169 (92.28)		-0.307		-0.385*	
	P100 latency (ms) whole view field-right eye	-0.164		-0.344*		-0.411*	
	P100 latency (ms) right view field- left eye (mean)	-0.165		-0.163 (89.103)		-0.374*	
	P100 latency (ms) right view field- right eye	-0.159		-0.155		-0.365*	
	P100 latency (ms) left view field-left (mean)	-0.170		-0.134		-0.326* (91.908)	
	P100 latency (ms) left view field-right eye	-0.218		-0.092		-0.381*	

* Statistical correlation on 0.05

In the schizophrenia group, all investigated parameters only on the left side, showed statistically significant differences in comparison with the right side of the same group. All correlations of occipital sulci patterns and P100 latency (whole view field of the left eye, whole view fields of both eyes, whole view field of right eye and left view field of left eye) were positive. Negative correlations were found in the control group with no statistically significant differences (Table 3).

DISCUSSION

The neuropathological process in schizophrenia may be related to a pre-existing neurodevelopmental loss of synaptic contacts as well as to ongoing deficits on the synaptic and molecular level resulting in an excessive loss of neuronal connectivity (12).

There is good evidence that there is a range of structural brain changes associated with schizophrenia like it is linked to damaged structure of the occipital cortex (13,14).

While cognitive dysfunction including memory and attentional deficits are well known in schizophrenia, recent work has also shown basic sensory processing deficits with impaired activation of the superior parietal, temporal and occipital cortex (15).

Deficits are particularly prominent in the visual system and may be related to cognitive deficits and outcome (16).

Patients with schizophrenia show severe neurophysiological deficits in brain information processing not only at cognitive levels (17-19), but also at perceptual levels (20-22) and perceptual deficits have been particularly well-documented in the visual system and have been shown to predict community outcome (23-31).

Further, the human visual system has been exquisitely characterized both functionally and anatomically permitting detailed examination of the brain mechanisms underlying dysfunction (32). Gender differences are evident in the morphology of brain structure in a healthy population, and studies point to identical differences in regions of the brain among men and women suffering from schizophrenia using MRI and VEP . Research conducted using these techniques suggests that many of the structural changes occur in sexually dimorphic areas of the brain (33).

Studies of gender differences in the context of schizophrenia, indicate that although the developing the disease is roughly the same among genders, men tend to develop schizophrenia earlier, with a worse prognosis and a premorbid history (34).

In our study, in regard to the age of patients, the minimum age in both groups was around 20 years, while the maximum age in the group of patients with schizophrenia was 67, and in the control group 55. Members of the group diagnosed with schizophrenia were on average 3.5 years older than those in the control group. Neuronal connections, lateralization of brain functions and axonal myelination are established earlier in female brains than in those of males. This slower level of development could make the male brain more vulnerable to earlier damages, resulting in structural brain abnormalities associated with the early onset of the illness and its negative symptoms. Our research conducted using MRI and VEPs revealed changes in the occipital lobe, especially of the left hemisphere (shallower depth of sulcus and P100 latency prolongation).

In terms of gender, among a group of male patients with schizophrenia, significant differences were registered of body of the calcarine sulcus, lower sagittal sulcus and the lateral occipital sulcus, which is consistent with a study conducted by Andreasen and associates (35,36). The results of our study are consistent with a study that compared the morphology of the cerebral cortex and its pattern of gyri and sulci depth of the occipital lobe and differences in visual structures of P100 latency in patients with schizophrenia, and in the area of the left hemisphere; differences in the depth of the sulcus (shallower) and latency prolongation were evident and were correlated with the degree of impairment of working memory and occipital lobe executive function (37,38).

Five MRI studies (39-42) reported volume reduction in the occipital lobe in schizophrenia while Davatzikos et al. reported reduced gray matter in occipital association areas in patients with schizophrenia (43).

Our research conducted using MRI and VEPs revealed changes in the occipital lobe, especially of the left hemisphere and structural deficits in occipital cortex, particularly in optic radiations, and their relationship to early visual processing deficits, document the importance of subcortical as well as cortical dysfunction in schizophrenia. A study examining cortical dysmorphology in patients with schizophrenia revealed diffuse cortical reduction in the left hemisphere in the group of male patients which correlates with our results (44). Descriptive statistical parameter values of the region of interest, as part of the occipital lobe, indicate significant differences in the group of male patients compared to female patients and the control group. Visual evoked potential measured in our study has shown that P100 (latency prolongation) was only on left eye in schizophrenic patients.

Schizophrenia is associated with deficits in higher order processing of visual information and steady state visual evoked potential responses recorded over the occipital cortex suggest a dysfunction of lower level visual pathways, which was more prominent for magnocellular than parvocellular biased stimuli. Our findings are consistent with studies that examined the morphology of the cortical surface, and which recorded a reduction of the gyrus index in both cerebral hemispheres of 3%-4.5%, but it was more pronounced in the area of the left side (45), which is consistent with the findings of five studies conducted in relation to the volume of the occipital lobes in schizophrenia (46).

In our study a descriptive comparative analysis of morphological variations in the occipital sulcus region of both hemispheres using MRI revealed the presence of significant differences particularly in the area of the left hemisphere in the group of male patients.

Changes in patients with schizophrenia were correlated with asymmetry of the left hemisphere with a statistically significant P100 latency prolongation on the left eye.

The difference degree of P100 medium latency was consistent with data of Bodis-Wollner and associates (47,48).

In conclusion, our findings reveal distinct multiple brain regions changes in the gray matter of patients with chronic forms of schizophrenia suggesting the existence of structural neuroanatomic disorders, ranging from evidence of focal brain changes, primarily of gray matter and its identification, and focus on damage of the brain. The finding of P100 deficits in patients, particularly over dorsal scalp, supports the view that schizophrenia is associated with impairment of early dorsal visual stream processing. These results imply that the cognitive impairment seen in schizophrenia is not just due to deficits in higher order aspects of cognition but also encompasses significant deficits in early sensory processing. Little is known about the association of schizophrenia with the occipital lobe or whether the visual symptoms exacerbate if the occipital lobe is severely damaged is not yet known. Also, if the whole occipital lobe is involved in schizophrenia or just some part of it is involved also remains an unsolved mystery. Our study is useful to initiate new questions and recommendations for further studies, specifically on changes in the occipital lobe in the schizophrenic patient's brain. Changes in the volume in the occipital lobe are quite evident and further studies are required to better understand how the progressive brain changes affect the structural, functional, and metabolic activities of the occipital lobe in schizophrenia.

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Magnetnorezonantni prikaz (MRI) i vizualno evocirani potencijali (VEPs) područja okcipitalne regije kod pacijenata oboljelih od shizofrenije i migrenozne glavobolje

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SAŽETAK

Cilj Komparirati morfološke razlike sulkusa okcipitalnog režnja pacijenata oboljelih od shizofrenije i migrenozne glavobolje u odnosu na spol i lateralnost primjenom magnetnorezonantnog snimanja (MRI) i vizualno evociranih potencijala (VEPs) s obzirom na oštećenje vizualnog puta kod pacijenata oboljelih od shizofrenije.

Metode Studija je uključila 80 pacijenata kod kojih je urađeno magnetno snimanje i vizualno evocirana stimulacija okcipitalnog korteksa radi analize okcipitalne regije obje hemisfere svakog ispitanika. Prosječne ukupne vrijednosti volumena obje hemisfere i vrijednosti P100 latencije zdrave populacije primijenjene su u komparativne svrhe.

Rezultati Statistički značajne razlike između ispitanika evidentirane su u odnosu na spol (p=0,012). Kada se posmatraju vrijednosti parametara tijela sulkusa kalkarinusa (p=0,0325), donjeg sagitalnog sulkusa (p=0,0443), lateralnog okcipitalnog sulkusa (p=0,0411), utvrđene su statistički značajne pozitivne korelacije s latencijama P100 vala (p=0,0449, p=0,0413, p=0,0321) samo u području lijeve hemisfere muških ispitanika oboljelih od shizofrenije s plićim sulkusima i prolongiranom latencijom P100 vala.

Zaključak Konzistentnost nalaza ukazuje na multiple moždane regije u području sive moždane mase pacijenata oboljelih od hronične forme shizofrenije. Neurokognitivni deficit kod shizofrenije pokazuje značajnu vezu s funkcionalnim ishodom bolesti.

Ključne riječi: neuropatologija, neuroradiologija, neurofiziologija, vizualni put