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Neuropsychological dysfunction in patients with amyotrophic lateral sclerosis

Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disease affecting motor neurons. Currently, it is suggested that ALS is a multisystems disorder of limited phenotypic expression (14). The question of neuropsychological impairment in ALS is discussed in the literature (12, 1). Abrahams et al. (4) revealed cognitive deficit in ALS patients and suggested that this deficit is dependent on frontal lobe dysfunction, mainly in patients with ALS expressing pseudobulbar palsy. According to Abe et al. (2) the gradient distribution of the scores for attention and executive function and single proton emission computed tomography (SPECT) findings suggest the presence of a continuum of cognitive impairment in ALS patients with frontal lobe pathology.

The aim of the study was to determine neuropsychological functions in ALS patients and to examine the relation between neuropsychological dysfunction and severity of clinical state of ALS patients and duration of the disease.

MATERIAL AND METHODS

Twenty-six patients (17 males/9 females) with an average age of 58 (range 40–77 years) took part in the study. The ALS was diagnosed according to El Escorial criteria of World Federation of Neurology. The average duration of the disease was 18 months. The patients were divided into two groups according to duration of ALS (short – up to 12 months, long – over 12 months) and into two groups according to severity of their clinical state. The severity of clinical state was measured by ALS Functional Rating Scale (ALS-FRS). The Luria-Nebraska test was used to assess neuropsychological deficit. Depression was measured by Zung Depression Scale. The study was approved by the Ethics Committee of Medical University. For statistical analysis the Fisher exact test was used. P values <0.05 were considered statistically significant. The characteristics of patients is presented in Table 1.

Table 1. The characteristics of patients

Group of ALS patients	Number of ALS patients (percent)
Mild clinical state	15 (57.7 %)
Severe clinical state	11 (42.3 %)
Short duration of ALS	15 (57.7 %)
Long duration of ALS	11 (42.3 %)

RESULTS

The study confirmed neuropsychological deficit in patients with ALS. Cognitive dysfunction in 88.4% of ALS patients was found; memory disturbances in 80.7%, attention deficit in 57.6%, and thinking disturbances in 53.8% of ALS patients were present. Depression in 38.4% of ALS patients was found. The frequency of neuropsychological dysfunction in ALS patients is presented in Table 2. The frequency of neuropsychological dysfunction in ALS patients depending on clinical parameters of the disease is presented in Table 3.

Table 2. The frequency of neuropsychological dysfunction in ALS patients

Neuropsychological dysfunction	Number of ALS patients (percent)
Cognitive dysfunction	23 (88.4%)
Memory dysfunction	21 (80.7 %)
Attention dysfunction	15 (57.6 %)
Thinking dysfunction	14 (53.8 %)
Depression	10 (38.4 %)

Table 3. The frequency of neuropsychological dysfunction in ALS patients depending on clinical parameters of the disease

Neuropsychological dysfunction	Number of ALS patients (percent)			
	Mild clinical state	Severe clinical state	Short ALS duration	Long ALS duration
Cognitive dysfunction	12 (52.2%)	11 (47.8%)	13 (56.6%)	10 (43.4%)
	p=0.17		p=0.61	
Memory dysfunction	11 (52.4%)	10 (47.6%)	11 (52.4%)	10 (47.6%)
	p=0.27		p=0.27	
Attention dysfunction	7 (46.7%)	8 (53.3%)	8 (53.3%)	7 (46.7%)
	p=0.17		p=0.45	
Thinking dysfunction	6 (42.9%)	8 (57.1%)	7 (50%)	7 (50%)
	p=0.46		p=0.32	
Depression	5 (50%)	5 (50%)	5 (50%)	5 (50%)
	p=0.65		p=0.53	

p – statistical significance

Data showed that neuropsychological dysfunction and depression were not dependent on the clinical state of ALS patients and duration of the disease (p>0.05).

DISCUSSION

Our study showed that neuropsychological dysfunction exists in patients with ALS but is not dependent on the clinical parameters of the disease. Depression was present in less than half group of ALS patients and was not correlated with severity of the clinical state of patients and duration of the disease. Hillemacher et al. (8) concluded that ALS patients often develop depressive symptoms. The authors observed a significant correlation between severity of the clinical state of patients and intensity

of depression. Contrary, depressive symptoms were negatively correlated with duration of ALS. The authors suggested that depressive symptoms could be reactive caused by diagnosis of ALS. Kilani et al. (10) also observed depressive symptoms and a mild deficit in cognitive functions in ALS. The cognitive impairment in ALS patients was previously observed by others (6, 13). Iwasaki et al. (9) showed a significant negative correlation between impairment of cognitive functions and upper motor neuron symptoms. According to Hanagasi et al. (7) ALS patients had dysfunction of memory, attention, verbal fluency, and complex visuo-spatial processing. The authors suggested that memory impairment may result from deficits in forming learning strategies. The measurement of regional cerebral blood flow in ALS patients with cognitive dysfunctions showed extra-motor involvement concerning a thalamo-frontal association pathway and dorsolateral prefrontal cortex (3). Abrahams et al. (5) using automated volumetric voxel-based analysis of grey and white matter densities of structural magnetic resonance imaging scans showed that the structural white matter abnormalities in frontal and temporal regions may underlie the cognitive and functional damage. According to Mantovan et al. (11) severity of memory deficits was correlated with cerebral blood perfusion detected by SPECT.

CONCLUSIONS

1. The study confirms a neuropsychological impairment in patients with ALS.
2. The memory dysfunction, the most frequent, has been observed.
3. The neuropsychological deficit was not dependent on the clinical parameters of the disease.

REFERENCES

1. Abe K.: Cognitive function in amyotrophic lateral sclerosis. Amyotroph. Lateral Scler. Other Motor Neuron Disord., 1, 343, 2000.
2. Abe K. et al.: Cognitive function in amyotrophic lateral sclerosis. J. Neurosci., 148, 95, 1997.
3. Abrahams S. et al.: Frontal lobe dysfunction in amyotrophic lateral sclerosis. A PET study. Brain, 119, 2105, 1996.
4. Abrahams S. et al.: Relation between cognitive dysfunction and pseudobulbar palsy in amyotrophic lateral sclerosis. J. Neurol. Neurosurg. Psychiatry, 62, 464, 1997.
5. Abrahams S. et al.: Frontotemporal white matter changes in amyotrophic lateral sclerosis. J. Neurol., 252, 321, 2005.
6. Dary-Auriol M. et al.: Amyotrophic lateral sclerosis and cognition disorders. Neuropsychological study of a population of 26 patients. Rev. Neurol. (Paris), 153, 244, 1997.
7. Hanagasi H. A. et al.: Cognitive impairment in amyotrophic lateral sclerosis: evidence from neuropsychological investigation and event-related potentials. Brain Res. Cogn. Brain Res., 14, 234, 2002.
8. Hillemacher T. et al.: Depression and bulbar involvement in amyotrophic lateral sclerosis. Amyotroph. Lateral Scler. Other Motor Neuron Disord., 5, 245, 2004.
9. Iwasaki Y. et al.: Neuropsychological dysfunctions in amyotrophic lateral sclerosis: relation to motor disabilities. Int. J. Neurosci., 54, 191, 1990.
10. Kilani M. et al.: A longitudinal study of the evolution of cognitive function and affective state of patients with amyotrophic lateral sclerosis. Amyotroph. Lateral Scler. Other Motor Neuron Disord., 5, 46, 2004.

11. Mantovan M. C. et al.: Memory deficits and retrieval processes in ALS. Eur. J. Neurol., 10, 221, 2003.
12. Montgomery G. K., Erickson L. M.: Neuropsychological perspectives in amyotrophic lateral sclerosis. Neurol. Clin., 5, 61, 1987.
13. Munte T. F. et al.: Recognition memory deficits in amyotrophic lateral sclerosis assessed with event-related brain potentials. Acta Neurol. Scand., 98, 110, 1998.
14. Strong M. J.: Progress in clinical neurosciences: the evidence for ALS as a multisystems disorder of limited phenotypic expression. Can. J. Neurol. Sci., 28, 283, 2001.

SUMMARY

Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disease. The aim of the study was to determine a neuropsychological function in ALS patients and to examine the relation between neuropsychological impairment and severity of the clinical state of patients and duration of the disease. The study concerned twenty-six patients with ALS. Data confirmed a neuropsychological dysfunction in ALS patients. The most frequent memory disturbances have been observed. The investigation showed that neuropsychological dysfunction in ALS patients was not dependent on the clinical parameters of the disease.

Zaburzenia neuropsychologiczne u chorych na stwardnienie boczne zanikowe

Stwardnienie boczne zanikowe (SLA) jest postępującą chorobą neurozwyrodnieniową. Celem pracy była ocena funkcji neuropsychologicznych u chorych na SLA oraz zależności zaburzeń tych funkcji od ciężkości stanu klinicznego chorych i czasu trwania choroby. Badaniem objęto dwudziestu sześciu pacjentów. Wyniki potwierdziły występowanie zaburzeń neuropsychologicznych u chorych na SLA. Najczęściej obserwowano zaburzenia funkcji pamięci. Badanie wykazało, że zaburzenia neuropsychologiczne u chorych na SLA nie zależały od parametrów klinicznych choroby.