UNIVERSITY OF MEDICINE AND PHARMACY CRAIOVA

FA C U L T Y  O F  M E D I C I N E

THE STUDY OF NEUROPHYSIOLOGICAL
AND CEREBRAL VASCULAR MODIFICATION
TO A LOT OF PATIENTS
WITH VASCULAR DEMENTIA
AND/OR ALZHEIMER'S DISEASE

DOCTORATE THESIS

- ABSTRACT -

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Key-words: Alzheimer’s disease, vascular dementia, Doppler ultrasonography, functional transcranial Doppler, neuropsychological tests, electroencephalography

The thesis is divided into two parts: part general - current state of knowledge dedicated to the field concerned and part special dedicated to personal contributions.

In the first part of the thesis, are presented notions of anatomy and physiology of cerebral circulation, clinical features and developmental pathogenesis of dementia, neuroimaging and electrophysiological features of investigations in dementia, notions of cognitive brain functions

The second part of the thesis, personal contributions, contains five chapters: materials and methods, results, discussion, conclusions and bibliography.

The objectives of this research were:

- identification and quantification of neurophysiological and vascular brain changes in a group of patients with vascular dementia, mixed dementia and Alzheimer's disease and severity assessment.
- establish a correlation between cognitive changes, EEG changes and changes in Doppler parameters in the groups studied.
- evidence of changes in early stages of disease

The study was performed on a lot of 110 patients (45 with Alzheimer's disease, 29 with vascular dementia and 36 with mixed dementia). Data obtained on this lot were compared with those of a control group with similar demographic characteristics.

Patients were assessed clinically, neuro-psychological, electroencephalographic and cerebral vasculature.

Cognitive status assessment was done using three neuropsychological tests: MMSE, Clock Drawing Test and A Quick Test of Cognitive Speed. Exploring vascular have made through extra - cranial Doppler, Trans cranial Doppler and transcranial Doppler functional. In terms of electrophysiological patients were explored using EEG.
For statistic analysis of data, I have used the Programme EPI Info2000 and SPSS, specialized in scientific statistic calculations. Registration and processing of patients data has been made in Excel, DATA ANALYSIS Module. I have used Analysis Data Module of EPI Info 2000 programme, specialized in statistical tests, graphics and tables.

Personal results are presented in Chapter six, grouping them as it follows: the results obtained in neuropsychological tests, the results obtained from extra-cranial Doppler exploration of the common carotid artery, internal carotid artery and vertebral artery, the results obtained from trans-cranial Doppler exploration of the middle cerebral artery and posterior cerebral artery, the results obtained from functional trans-cranial Doppler exploration, the results obtained from EEG. Studied correlations between parameters are then obtained on three groups of patients.

In Chapter Seven, entitled discussions, results and correlations previously established are discussed making it a comparison between groups of patients with vascular dementia, mixed dementia and Alzheimer's disease. The data obtained are compared with those of literature.

Chapter Eight presents the conclusions of this study:

1. The research was performed over a period of three years on a group of 110 patients of which 29 patients with vascular dementia (26.4%), 36 patients with mixed dementia (32.8%) and 45 patients with Alzheimer's disease (40.8%). Results of the study were compared with those from a control group of 90 clinically healthy persons of the same age group.

2. The average age of patients with Alzheimer's disease was 75.6 years (± 6.8), those with mixed dementia 75.2 years (± 7.2) and those with vascular dementia 76.3 years (± 5, 5). In terms of distribution by age showed that patients are most numerous in the age group 71-80 years, i.e. 58 patients (52.7%); living environment has been predominantly rural, respectively 52.7% (58 patients). Proportion of men: women was 1:1.2

3. The group of patients was evaluated clinical and paraclinical complex, were performed using three neuropsychological tests, namely: MMSE, clock drawing test and AQT-color-shape. We studied the cerebral irrigation using noninvasive ultrasound exploration both extracranial and transcranial Doppler with a Fukuda Denshi UF-850XTD ultrasound equipped with an electronic linear probe for cervical vessels with selectable frequency 6.0 / 7.5 / 9.0 MHz electronic sector probe (phased array)cardiovascular selectable frequency 2.5 / 3.5 / 4.5 MHz, we also investigated the changes that occur during performance of various tasks to stimulate specific brain areas
4. Neuropsychological tests showed that using only a single test such as the MMSE, may not appreciate the severity of the syndrome, because this syndrome has multiple sides to be properly assessed individually.

5. Extracranial and transcranial Doppler vascular exploration aimed to common carotid artery, carotid internal artery, vertebral artery, middle cerebral artery and posterior cerebral artery. Significant changes were observed, statistically significant, different from control group in all three groups studied. Doppler parameters studied were assessed blood flow volume, wall thickness and indirect vascular vessel lumen, vascular wall elasticity and distensibility, resistance in cerebral circulation.

6. Note that the most significant changes in these parameters have recorded from vascular dementia and mixed groups compared with controls, but also to the group of patients with Alzheimer's disease.

7. Exploring extra-cranial Doppler performed at both anterior circulation (ACC and ACI) and the posterior circulation (AV) revealed that a highly vascular parameters studied in recent years, namely intima-media thickness (IMT) was significantly correlated with the presence of dementia, its changes are more evident in groups with vascular dementia and mixed dementia.

8. Changes of the report VD / IR, a parameter introduced by us to better characterize the resistance changes in cerebral circulation, have validated this parameter as important in differentiating types of dementia.

9. Also other ECD parameters showed significant changes in the group of patients with dementia, to note decrease the blood flow in the ICA and VA reflects the importance of a "vascular pathways" in appearance and evolution of types of dementia studied.

10. Exploring trans-cranial Doppler showed that the decrease in average speeds and increase the pulsatility, was associated with a diagnosis of dementia. Disorder demonstrated intracerebral blood flow changes in these parameters reflect global hemodynamic and structural consequences of a multifaceted disease process that is probably based on changes in microvascular, increased stiffness and decreased the arterial compliance.

11. Changes in TCD parameters showed different patterns between types of dementia, so in Alzheimer's disease and mixed dementia there were significant differences between circulation in the two hemispheres regardless of whether we are talking about average speed or pulsatility index, for the vascular dementia significance was not achieved. These changes correlated to obtain results with statistical significance between the group of patients with Alzheimer's disease and mixed dementia with vascular dementia group, without dementia between AD and mixed dementia to be statistically significant differences, lead to the conclusion that the vascular changes that
occur in Alzheimer's disease are progressive accelerated character if the patient has major vascular events, but not to significantly change the intracerebral circulation pattern.

12. Exploration TCD-f led to the conclusion that the changes present in basal conditions be maintain and if to boost brain regions, with statistically significant differences between types of dementia, these changes may be additional criteria to discriminate between different types of syndromes, they while bringing additional data in understanding the changes that occur in the brain.

13. It was noted that with regard to Alzheimer's disease is a gradation of vascular changes depending on the disease, so if changes are present in the anterior circulation of the early stage, changes occurring in the posterior circulation thereby supporting more advanced that there is a sequence "time "of vascular changes.

14. Diffuse EEG changes routes were increased in patients with Alzheimer's dementia, although the response induced by light stimulation and the average frequency of the basic activity in all groups decreased with increasing degree of dementia. This was a decrease of alpha waves and a relative increase theta and delta waves with increasing degree of dementia. Changes focal and irritation (such as peak or peak-wave), slow wave paroxysm were more common than vascular dementia and mixed dementia in Alzheimer's dementia.

15. Note that there is good correlation between Doppler parameters determined at both extracranial and intracranial level with the presence of theta waves and EEG changes, which actually translates to a deficiency in coupling neuronal activation given of reducing the flow blood.

**FINAL CONCLUSION**

a. Present research, extensive, complex clinical and paraclinical to a group of patients with Alzheimer's disease, mixed dementia and vascular dementia using noninvasive methods of exploration: neuropsychological testing, cerebral vascular ultrasound Doppler exploration, extracranial and transcranial and functional transcranial Doppler, electroencephalography , it is less mentioned in the literature.

b. Using in this study a new vascular Doppler parameter (VD / IR), which considers the degree of resistance in the cerebral circulation, together with IR, is original, not mentioned in the literature.

c. Correlation of neuropsychological tests with Doppler exploration, including Doppler functional and neuroelectrophysiological methods, not mentioned in the literature study led to interesting results and conclusions related to the disease.

d. Exploring cerebrovascular Doppler ultrasound can detect and treat correctable lesions of arteries supplying the brain, that may become a very useful tool, cost-effective, in early diagnosis of cognitive disorders.
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| **Dates**                      |
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| 2002-2006 Resident Neurologist Neuro-Psychiatric Hospital, Craiova |
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| 1998 junior doctor County Emergency Hospital, Craiova |

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| 2010 Certificate in Cerebral Doppler Ultrasound |
| 2003 Certificate in Homeopathy |
| 2000 Certificate in General Ultrasound |

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Papers published in refereed proceedings of national conferences / selectioncommittee and program committee


Papers published in international conferences


