

ANALYSIS OF TYPE OF BRAIN INJURY AND THEIR CORRELATION WITH VASCULAR DEMENTIA COGNITIVE DECLINE DEGREE

Elisaveta Ligia PIROS, Gheorghe CIOBANU, Anca MUSTEA,
Sanda Maria DEME, Harry GROSSMANN, Delia Marina PODEA

Faculty of Medicine, Pharmacy and Dental Medicine, "Vasile Goldis" Western University of Arad

ABSTRACT. Existing epidemiological tests known presently in Romania show that memory diseases are common, on top of those diseases hovering Alzheimer's disease, followed, in order, by vascular dementia, mixed dementia, fronto-temporal dementia and parkinsonian dementia.

The study sought to evaluate cognitive disorders in the context of cardiovascular diseases in elderly. Cardiovascular pathology is the number one cause of morbidity and mortality in the elderly, primary place belonging to hypertensive pathology.

A prospective study was initiated and the aim was to determine the prevalence of vascular dementia in a population of patients with cognitive deterioration and changes on CT-imaging appearance, following, also, by evaluation of clinical implications. Discussions of the findings showed up issues concerning the delimitation of vascular dementia diagnosis.

Keywords: computed tomography, vascular lesions, vascular dementia, risk factors, prevention.

INTRODUCTION

Structural changes, metabolic and vascular flow in the brain, (that underlie all cognitive dysfunction), can be observed and quantified.

Imaging procedures are grouped into structural and functional imaging methods.

Worth mention about the structural CT, which is used more and more frequently and which can detect most cases of reversible cognitive impairment.

In terms of clinical protocols, structural imaging is often used after the initial evaluation of a patient with cognitive impairment, to exclude other cerebral pathology or to demonstrate vascular pathology as a cause of symptomatic complaints. The diagnosis of vascular dementia is largely based on the demonstration of significant cerebrovascular disease on imaging brain response, combined with a clinical history characteristic and often with evidence of focal neurological signs and symptoms on examination.

MATERIALS AND METHODS

The study included subjects investigated on CT at Euromedic Arad, who have cognitive impairment, the objective psychological tests and CT changes of cortical atrophy. Material used in this study include all the logistics of clinical data from patient history, analyzed over a period of four years, from 2007 to 2011.

As a working method we analyzed and used data obtained from the clinical signs, identification of risk factors, CT analysis and physical and psychological

cognitive deficits tests. Statistical data were processed with the SPSS 19.

We analyzed a group of 100 subjects aged over 65 with CT changes, MMSE, risk factors for vascular dementia and associated pathology.

RESULTS AND DISCUSSION

Data collected in the study were organized in a database and then processed with SPSS 19. The study includes 100 subjects, diagnosed with vascular cerebral atrophy. For these patients data processing was conducted descriptive, we calculated Pearson correlation coefficients between the number of injuries, associated risk factors, MMSE score and other important variables such as patient age and disease onset age. Later correlations were made between data from patients, comparing male and female ones. A linear regression analysis was performed to see which variables are predictive of the number of vascular lesions.

Descriptive results for patients with vascular atrophy

To build an accurate representation of the people with vascular dementia, we have taken in account the vascular lesions, associated risk factors and MMSE score. In order to achieve correlation analysis, we summed the number of vascular lesions and number of risk factors. After processing being synthesized descriptive indices are presented in Table 1.



Table 1

Descriptive indices for the number of vascular lesions, number of risk factors and MMSE score

	Number of lesions	Number of risk factors	MMSE
Average	7,1837	2,3061	25,9694
Median	7,0000	2,0000	27,0000
Standard deviation	1,85754	,91277	2,34830
Minimum	4,00	1,00	20,00
Maximum	12,00	4,00	29,00

Notice that subjects enrolled in this stage have at least four vascular lesions, vascular lesions maximum number for a patient being 12 and average vascular lesions 7.18 (sd = 1.85). If we investigate the presence of risk factors, at least one risk factor for each patient and a maximum of 4 risk factors (m = 2.30, SD = 0.91) were found. MMSE scores of patients range between 20 and 29, with an average m = 25.96 and standard deviation sd = 2.34.

The results show that some lesions are more evident or present in all patients, such as internal cortical atrophy, and others are present in a small number of people.

The figure below is an hierarchyc illustration of the type of vascular lesions presented in subjects with vascular dementia; we can observe that the lesions most frequently mentioned as present affect more than 50% of the investigated patients, while uncommon lesions affect less than 20% of patients

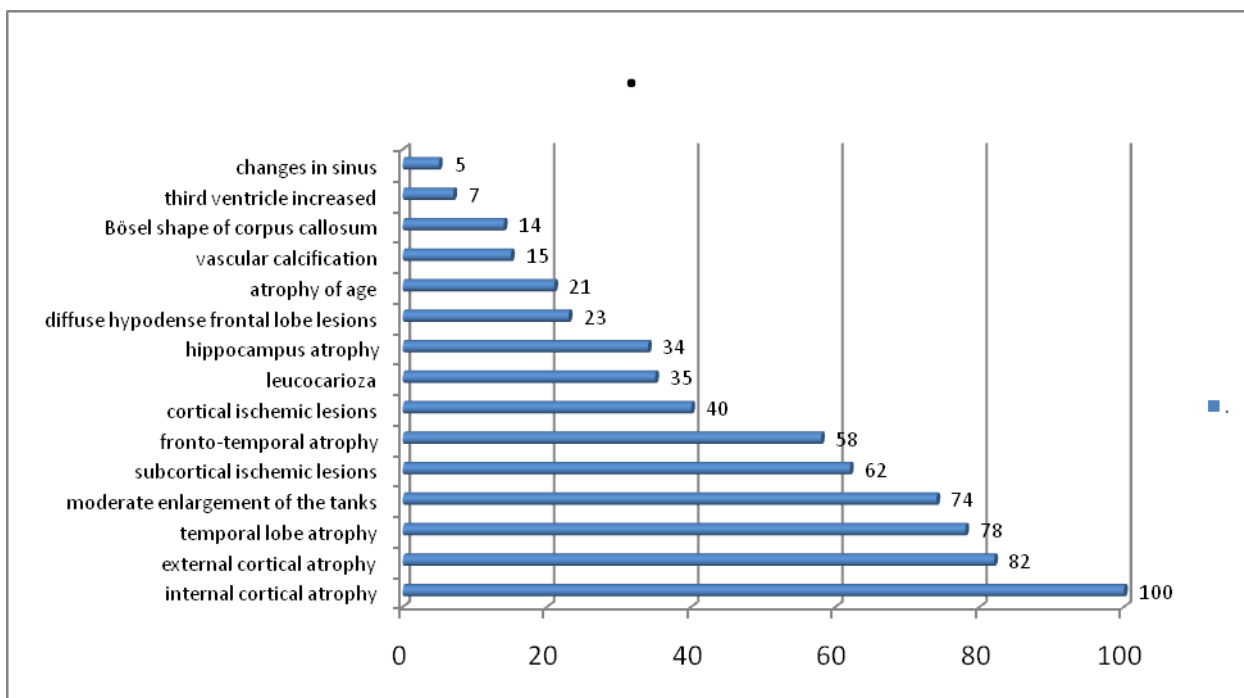


Fig. 1. Vascular lesions in patients with vascular atrophy

Analysis of correlations

To find out the factors associated with vascular lesions, factors that could be potential predictors, we performed a correlation analysis, calculating indices of correlation between the number of vascular lesions, age of patients in the study, age of disease’s onset, number

of risk factors and the score for the MMSE. Correlation indices obtained are summarized in Table 8; the correlations statistically significant at a threshold p less than 0.05 are shown in the diagrams illustrated below.

Table 2

Correlations between number of vascular lesions, age, onset age, number of risk factors and MMSE score

		lesion number	Age	onset	number of risk factors	mmse
lesion number	r	1	,048	,125	,891**	-,864**
	p		,642	,219	,000	,000
	N	100	100	100	100	100
age	r	,048	1	,892**	-,046	-,078
	p	,642		,000	,654	,444
	N	100	100	100	100	100
onset	r	,125	,892**	1	,038	-,101
	p	,219	,000		,708	,324
	N	100	100	100	100	100
number of risk factors	r	,891**	-,046	,038	1	-,842**
	p	,000	,654	,708		,000
	N	100	100	100	100	100
mmse	r	-,864**	-,078	-,101	-,842**	1
	p	,000	,444	,324	,000	
	N	100	100	100	100	100

We can observe a statistically significant correlation between the first number of vascular lesions and number of risk factors: $r = 0.891$ to $p = .000$.

Therefore, the greater number of risk factors the greater is the number of vascular lesions.

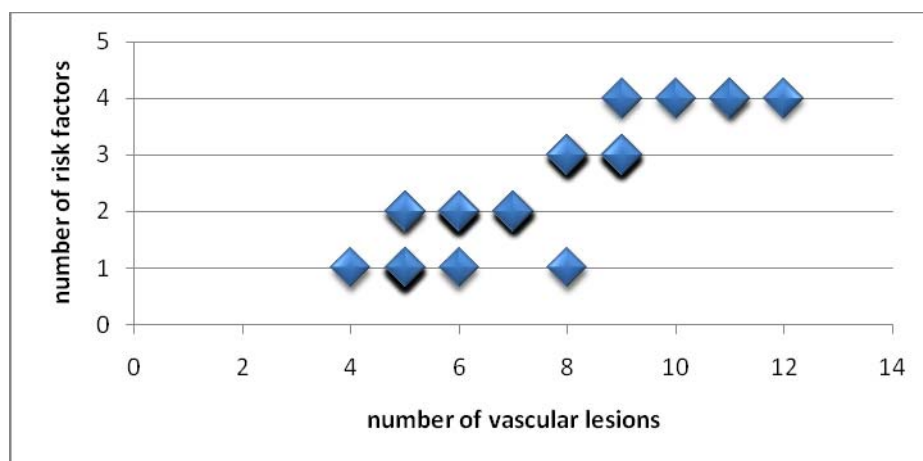


Fig. 2. Diagram of correlation between the number of vascular lesions and number of risk factor

Positive association between two variables can be seen in the correlation diagram (Figure 2), where the cloud of points is oriented from top to bottom and from left to right.

A strong significant negative correlation ($r = -0.864$ at $p = .000$) was obtained between the number of vascular lesions and the MMSE score. Thus, the greater the

number of vascular lesions, the lower is the MMSE score obtained. This correlation is illustrated in the diagram (Figure 3) through a cloud of points oriented from top to bottom and from left to right. Notice that the cloud of points is very compact, which shows a strong correlation between MMSE score and number of vascular lesions, as seen from the Pearson correlation coefficient previously.

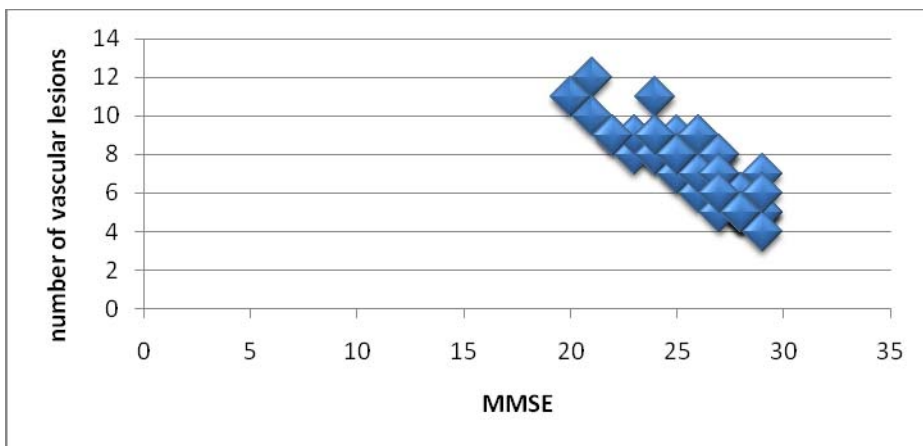


Fig. 3. Diagram of correlation between the number of vascular lesions and the MMSE score

We noticed a significant positive correlation between age of the patients and age of disease onset. Thus, the correlation coefficient between two variables is $r = 0.892$

to $p = .000$ threshold, i.e. well below the .05 threshold accepted by the scientific community. This correlation is illustrated in Figure 4.

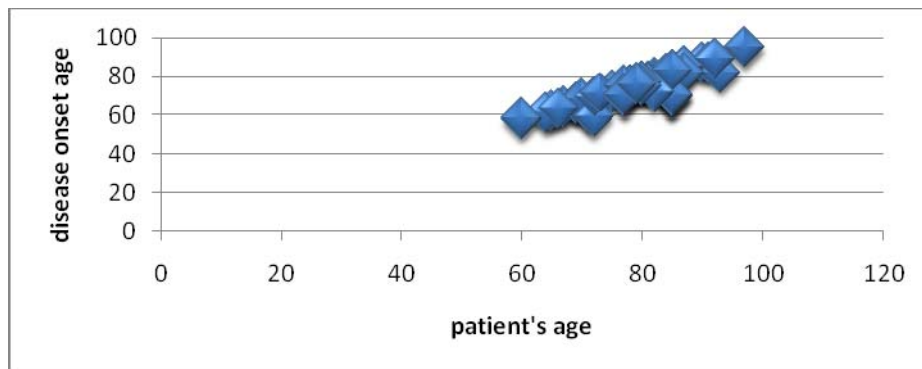


Fig. 4. Diagram of correlation between patient age and age at onset

MMSE score correlates significantly negatively with the number of risk factors found in patients with vascular dementia. The higher the number of risk factors, the lower the MMSE score. It is represented in the figure from below, (Figure 5), where can be noticed the orientation of the cloud of points from top to bottom

and from left to right. Strong association between two variables is suggested by a compact cloud of points, oriented almost along a straight line. This is consistent with the high value of correlation coefficient: $r = -0.842$ at $p = .000$.

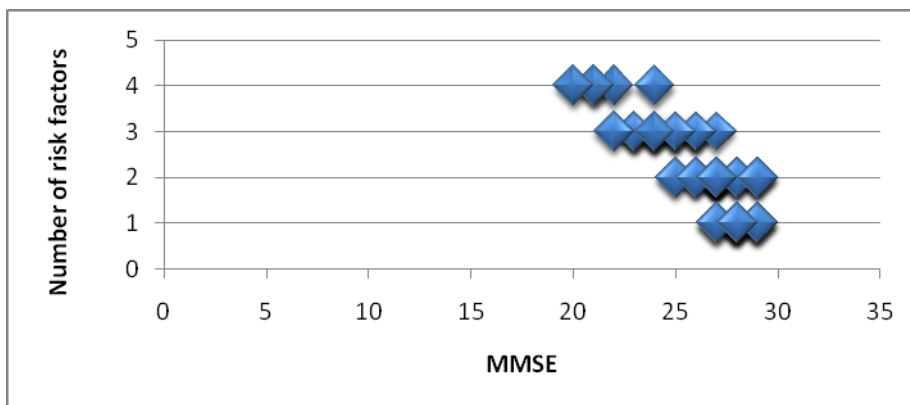


Fig. 5. Diagram of correlation between number of risk factors and MMSE score

The results included in the study sample demonstrate the following significant predictors at a threshold lower than 0.05: millimetric subcortical ischemic lesions paraventricular, increased third ventricle, temporal lobe atrophy, vascular calcification, multirounded outline of the corpus callosum and suboccipital arahnoidian cysts.

Recent research shows that white matter lesions occur with age as early signs of vascular disease, triggering cognitive decline and impaired functional capacity. The resulting disease is characterized by sub-cortical vascular dementia. This type of dementia is probably the most common and consistent type of vascular dementia.

Neuro-physiologic tests are tools to evaluate the clinical and cognitive impairment associated with vascular dementia. Patients suffering of advanced cases of vascular dementia usually are treated by psychiatris; in this type of patients case it is demonstrated their marked cognitive decline.

CONCLUSIONS

The results included in the study sample demonstrate the following significant predictors at a threshold lower than 0.05: millimetric subcortical ischemic lesions paraventricular, increased third ventricle, temporal lobe atrophy, vascular calcification, multirounded outline of the corpus callosum and suboccipital arahnoidian cysts.

Recent research shows that white matter lesions occur with age as early signs of vascular disease, triggering cognitive decline and impaired functional capacity. The resulting disease is characterized by sub-cortical vascular dementia. This type of dementia is probably the most common and consistent type of vascular dementia.

Neuro-physiologic tests are tools to evaluate the clinical and cognitive impairment associated with

vascular dementia. Patients suffering of advanced cases of vascular dementia usually are treated by psychiatris; in this type of patients case it is demonstrated their marked cognitive decline.

REFERENCES

- Alexopoulos GS, Abrams RC, Young RC, Shamoian CA. Cornell Scale for Depression in Dementia. *Biol Psychiatry*. Feb 1 1988;23(3):271-84.
- American Psychiatric Association. *Diagnosis and Statistical Manual of Mental Disorders. Fourth Edition. Text Revision (DSM-IV-TR)*. Washington, DC: American Psychiatric Press; 2000.
- Chui H.C., Victoroff J.I., Margolin D. et al. Criteria for the diagnosis of ischemic vascular dementia proposed by the state of California Alzheimer's disease diagnostic and treatment centers. *Neurology* 1992 ; 42 : 473-480.
- Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. Nov 1975;12(3):189-98.
- Fryback D, Thornbury J: The efficacy of diagnostic imaging. *Med Decis Making* 1991:88-94.
- Pirtilla T., Jarvenpaa R., Laippala P., Frey H.: Brain atrophy on computed axial tomography scans : interaction of age, diabetes, and general morbidity. *Gerontology* 38 : 285-291, 1992.
- Roman GC. The epidemiology of vascular dementia. *Handbook of Clinical Neurology*. 2008;vol. 89(3rd series):639-658.