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CLINICAL AND NEUROPSYCHOLOGICAL FEATURES OF VASCULAR DEMENTIA AND THE RELATIONSHIP BETWEEN COGNITIVE IMPAIRMENT AND VASCULAR RISK FACTORS

Abramyan A.A.
Associate Professor, Department of Neurology,
Andijan State Medical Institute, Uzbekistan
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Abstract. Objective. To investigate the clinical and neuropsychological features of vascular dementia, characterize the pattern of cognitive impairment, and assess its relationship with major vascular risk factors. Materials and Methods. The illustrative study included 150 participants: 80 patients with vascular dementia, 40 patients with mild vascular cognitive impairment without dementia, and 30 apparently healthy controls. The proposed assessment included clinical and neurological examinations, cognitive testing using the Montreal Cognitive Assessment (MoCA), evaluation of vascular risk factors, and analysis of brain magnetic resonance imaging (MRI) findings. Results. In the simulated dataset, the mean MoCA score was 15.8 ± 3.6 in patients with vascular dementia, 22.4 ± 2.1 in patients with mild vascular cognitive impairment, and 27.1 ± 1.4 in the control group. The most frequently reported vascular risk factors in the vascular dementia group were arterial hypertension (90.0%), dyslipidemia (65.0%), and a history of stroke (60.0%). Executive dysfunction and impaired attention were the most prominent cognitive deficits in the illustrative dataset. Conclusion. Comprehensive assessment of cognitive functions, vascular risk factors, and neuroimaging findings is important for the diagnostic evaluation of vascular dementia and the development of individualized patient management strategies.
Keywords: vascular dementia, cognitive impairment, MoCA, arterial hypertension, cerebrovascular disease, neuropsychological assessment, brain MRI.

Introduction. Vascular dementia is an important cause of acquired cognitive decline in older adults. It develops in association with cerebrovascular injury and may result from clinical strokes, cerebral small vessel disease, multiple lacunar infarctions, and extensive white matter abnormalities.

The clinical presentation of vascular dementia is heterogeneous. In addition to memory impairment, patients may experience reduced attention, slowed information processing, executive dysfunction, and visuospatial deficits. The severity of cognitive impairment depends on the location and extent of cerebrovascular lesions and may also be influenced by concomitant neurodegenerative processes [1, 2]. Major modifiable vascular risk factors include arterial hypertension, diabetes mellitus, dyslipidemia, smoking, and cardiovascular disorders. Their early identification is important for secondary stroke prevention and for reducing the risk of further cognitive deterioration.

Despite advances in neuroimaging and neuropsychological assessment, the evaluation of vascular cognitive impairment requires a comprehensive approach. Standardized cognitive screening combined with clinical examination and brain MRI can provide a more complete characterization of the patient's cognitive profile [2, 3].

Objective: To investigate the clinical and neuropsychological features of vascular dementia, assess the severity of cognitive impairment, and examine its relationship with vascular risk factors.

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Materials and Methods

For illustrative purposes, a simulated study population of 150 participants was constructed.

Table 1.

Distribution of participants by study group

Study group	Number of participants
Patients with vascular dementia	80
Patients with mild vascular cognitive impairment	40
Apparently healthy controls	30
Total	150

The proposed inclusion criteria involved clinical evidence of cognitive decline in the two patient groups and the absence of substantial cognitive impairment in the control group. In an actual study, the diagnosis of vascular dementia should be established using accepted clinical criteria, assessment of functional independence, and relevant neuroimaging findings.

The proposed assessment protocol included medical history and clinical neurological examination; cognitive assessment using the Montreal Cognitive Assessment (MoCA); evaluation of attention, memory, and executive functions; documentation of arterial hypertension, diabetes mellitus, dyslipidemia, smoking, and previous stroke; and assessment of cerebrovascular abnormalities on brain MRI.

All numerical values presented in this manuscript are simulated and are intended solely to demonstrate the presentation of research findings. For a real study, statistical analysis should include assessment of data distribution, selection of appropriate between-group tests, calculation of confidence intervals, and evaluation of statistical significance at a threshold of $p < 0.05$.

Results

1. Comparative assessment of cognitive function

In the simulated dataset, mean MoCA scores progressively decreased from the control group to the mild vascular cognitive impairment group and the vascular dementia group.

Table 2.

Cognitive assessment scores

Study group	MoCA score, mean ± SD
Vascular dementia (n = 80)	15.8 ± 3.6
Mild vascular cognitive impairment (n = 40)	22.4 ± 2.1
Control group (n = 30)	27.1 ± 1.4

The simulated mean MoCA score was 6.6 points lower in the vascular dementia group than in the mild vascular cognitive impairment group and 11.3 points lower than in the control group. These differences illustrate a possible gradient in cognitive impairment severity; however, they are not verified clinical findings.

2. Pattern of cognitive impairment

Executive dysfunction and impaired attention were the most frequently represented cognitive deficits in the simulated vascular dementia group.

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Table 3.
Frequency of impairment in individual cognitive domains among patients with vascular dementia

Cognitive domain	Number of patients	Percentage
Executive functions	66	82.5%
Attention and information processing speed	62	77.5%
Memory	56	70.0%
Visuospatial functions	44	55.0%
Language functions	28	35.0%

The simulated distribution emphasizes the importance of evaluating multiple cognitive domains. Memory testing alone may be insufficient to characterize vascular cognitive impairment, particularly in patients with cerebral small vessel disease [2, 3]. Percentages are not expected to sum to 100%, because individual patients may have impairments in several cognitive domains simultaneously.

3. Prevalence of vascular risk factors

Arterial hypertension was the most prevalent vascular risk factor in the simulated vascular dementia group.

Table 4.
Major vascular risk factors among patients with vascular dementia

Risk factor	Number of patients	Percentage
Arterial hypertension	72	90.0%
Dyslipidemia	52	65.0%
Previous stroke	48	60.0%
Type 2 diabetes mellitus	28	35.0%
Smoking	20	25.0%
Atrial fibrillation	18	22.5%

These simulated findings illustrate the potential coexistence of multiple vascular risk factors in individual patients. In clinical practice, identifying these factors helps guide secondary stroke prevention and the management of associated cardiovascular and metabolic conditions.

4. MRI findings associated with cerebrovascular injury

Table 5.
Simulated frequency of neuroimaging abnormalities in the vascular dementia group

MRI finding	Number of patients	Percentage
White matter hyperintensities	68	85.0%
Lacunar infarcts	50	62.5%
Post-infarction changes	46	57.5%
Cerebral microbleeds	16	20.0%

Several MRI abnormalities may coexist in the same patient. Interpretation should consider lesion location, extent of white matter disease, the number and distribution of lacunes, and the relationship

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between imaging findings and the clinical presentation. Individual MRI abnormalities alone are insufficient to establish a diagnosis of vascular dementia.

5. Relationship between cognitive impairment and vascular factors

Hypothetical correlation coefficients were included to illustrate the presentation of a statistical analysis.

Table 6.

Illustrative correlations between cognitive performance and vascular factors

Variables	Simulated correlation coefficient (r)
MoCA score and duration of arterial hypertension	−0.42
MoCA score and number of previous strokes	−0.48
MoCA score and severity of white matter abnormalities	−0.51

The negative coefficients in this illustrative model indicate that greater vascular burden was assumed to be associated with lower MoCA scores. However, without actual individual-level data, confidence intervals, and statistical significance testing, these coefficients cannot establish real clinical associations.

Discussion. Vascular dementia is characterized by considerable clinical heterogeneity and may involve different combinations of memory impairment, reduced attention, and executive dysfunction. Diagnosis requires evidence linking cognitive decline to cerebrovascular disease and an assessment of the impact of cognitive symptoms on everyday functioning [1, 2].

The simulated findings demonstrate a possible framework for comprehensive analysis, including comparisons of cognitive scores, assessment of individual cognitive domains, evaluation of vascular risk factors, and correlation with MRI findings. This framework may help guide the design of a clinical study using real patient data.

An important aspect of patient management is the modification of vascular risk factors. Blood pressure control, management of diabetes and dyslipidemia, smoking cessation, and prevention of recurrent stroke are key components of vascular risk reduction. Specific management decisions should be individualized according to the patient's clinical condition and current guidelines.

The principal limitation of this manuscript is the use of simulated data. Consequently, the results cannot be interpreted as evidence of statistically significant differences or causal relationships. Confirmation requires a study conducted according to a predefined protocol, with an adequate sample size and adjustment for potential confounding factors.

Conclusion. Comprehensive cognitive assessment is an important component of the diagnostic evaluation of vascular dementia.

Assessment of executive functions, attention, memory, and visuospatial abilities provides a more complete characterization of cognitive impairment.

Identification and management of vascular risk factors are essential for the prevention of recurrent cerebrovascular events.

Integration of neuropsychological assessment with brain MRI findings helps clarify the potential contribution of cerebrovascular disease to cognitive impairment.

The tables and figures presented provide a framework for planning an original clinical study; all numerical findings must be replaced with actual clinical data before publication.

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