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A short communication about vascular dementia

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Abstract

Introduction: The Vascular Dementia (VaD) is an irreversible neurocognitive disorder related to cerebrovascular disorders. It is considered the second most common type of dementia after Alzheimer's disease. **Methods**: The references included reviews published in the last 5 years, found through a search on PubMed database using the terms "Vascular Dementia", "Clinical Diagnosis" and "Cerebrovascular Disease". The articles were selected by analyzing the title and the abstract. **Results**: The initial search found 2556 results.

105 articles were selected when analyzed by time period, type of work (review) and MEDLINE filters. Those were the ones analyzed by tittle and by abstract, which left 9 articles considered useful for the proposal. **Discussion**: An insufficient amount of data about the physiopathology of the Vascular Cognitive Impairment (VCI) were found. The absence of epidemiological data about VaD makes it impossible to develop researches related to the quantitative contribution of the vascular disease for VCI. The presence of coexisting comorbities in patients with VaD is a possible presentation, which turns important the correct identification of other simultaneous dementia cases. **Conclusion**: The VaD is considered a cognitive disorder that incorporates behavioral symptoms and locomotor system abnormalities. The repercussion of vascular disease in cognition is already known, but recent studies and advances in neuropathology, genetic and epidemiology have helped to deeply understand the VaD and its relation with VCI.

1.INTRODUCTION

VaD is an irreversible condition that can culminate with global or focal effects of vascular disease, mainly related to various cerebrovascular disorders, such as hypoperfusion, hypoxia, ischemia, and stroke. It is also characterized as a neurocognitive disorder that incorporates behavioral symptoms, memory and language difficulties, locomotor abnormalities, parkinsonian gait disorder and autonomic dysfunction, Wang et al (2018), Kalaria (2017). The definition of VaD subtypes considers the cause and extent of vascular pathologies, the grade of involvement of extra and intracranial vessels, the anatomical location of tissue changes, and the time after the initial vascular event, with the combination of atherosclerotic and cardioembolic diseases being the most common subtypes of vascular brain injury, Kalaria (2017).

VaD is widely considered the second most common type of dementia after Alzheimer's Disease (AD), Wang et al (2018), Kalaria (2017). Nevertheless, the proper definition and the causes of the disea-

se are variable and are hampered by the limits of neuroanatomic and pathophysiological perception, which causes some uncertainty about the prevalence and incidence of VaD in the published literature, Wolters & Ikram (2019). In North America and Europe, it represents about 15-20% of dementia cases, Lobo et al (2000), Rizzi et al (2014), and 30% in developing countries, Kalaria (2008). Worldwide, the incidence of VaD is higher in older populations, Wolters & Ikram (2018). Despite of the reported declining in incidence of VaD, Wolters & Ikram (2019), the increasing numbers of obesity, diabetes mellitus and systemic arterial hypertension, all related to the pathology, brings importance for the studies about this pathology, GBD (2018), NCD-RisC (2016), NCD-RisC, (2017).

2. METHODS

The references used were composed by reviews published in the last 5 years, chosen through a search on the PubMed database using the keywords "Vascular Dementia", "Clinical Diagnosis" and "Cerebrovascular Disease". The articles were selected first by title, then by abstract.

3.RESULTS

The initial search found 2556 results. After analyzing time period, type of work (review) and MEDLINE filters, 105 remained. Those were the ones analyzed by tittle and abstract, which left 9 articles considered useful for the proposal.

The **Table I** reunite the main findings of the select articles, which discussion is presented hereafter.

Reference	Main Findings
Skrobot et al (2017)	The Cognition's Classification of Vascular Impairment of Consensus Phase 1 Study (VICCCS-1) shows that the major presentations of VCI observed in the VaD should be classified in 4 main subtypes: (i) Post-Stroke Dementia (PDS); (ii) Subcortical Ischemic Vascular Dementia (SIVaD); (iii) Multi-Infarct (cortical) Dementia (MID); and (iv) Other dementias; divided according to other informations of degenerative neuropathologies.
Love and Miners (2017)	a) The VaD is responsible for about 10 to 20% of dementia cases. b) In the ischemic parenchyma, the age is the main cause of VCI or VaD. c) Some situations of clinical evaluation predict the development of VaD. These includes history of hypertension; heart disease; diabetes mellitus; transient ischemic attacks, stroke, urinary incontinence; and personality changes, sometimes in the absence of memory problems. The clinical stage is called VMCI.
Smith (2017)	Small vessels disease – marked by cerebral vascular injuries, as infarctions and micro bleedings – seems to be the most common cause of VCI according to autopsies.
Wallin (2017)	a) VaD resulting from severe VCI or from late onset post-stroke sequels seems to be caused by many lesions, including cerebral atrophy. b) Most cases of atrophy in risk patients with CI are results from non-vascular neurodegenerative disorders. c) NA-SVD are the more common VCI and the most prevalent lesion, occurring as part of a dysfunction of arteriolar perfusion that affects mostly tissues with high perfusion rate as brain, retina and kidneys. d) In comparison with AD, patients with NA-SVD have a less pronounced episodic memory deficit, but the symptomatology is more depressive and more variable in disease progression speed. Patients with AD and severe memory impairment remain relatively independent while executive functions are still working. In contrast, NA-SVD can lead to early onset and progressive executive dysfunction with high risk of severe cognitive impairment development.
Fisher et al (2018)	The main criteria for VCI diagnosis are test-proved neurocognitive deficit and CVD.
Lang (2017)	NA-SVD causes center encephalic hemorrhages and lacunar infarctions, while CAA causes lobar hemorrhages, cortical micro infarctions and micro bleedings.
Etherton-Beer (2014)	The control of cardiovascular risk factors in middle-aged people reduces VCI in aged populations.
Garcia and Garcia (2011)	The main determinants of VCI and its evolution are: multiple infarction dementia; strategic infarction dementia; subcortichal isquemic VaD; hemorrhagic dementia; hypoperfusion mixed dementia.
Ferrari et al (2017)	Visuospatial skills, gait disturbance, urinary incontinence and behavioral changes are also statistically impaired in CAA.

Table I – Results by reference. Abbrevia-

tions: AD – Alzheimer's Disease; CAA – Cerebral Amyloid Angiopathy; CI – Cognitive Impairment; CVD – Cerebral Vascular Diseases; NA-SVD – Non-Amiloid Small Vessel Disease; VaD – Vascular Dementia; VCI – Vascular Cognitive Impairment; VMCI – Vascular Mild Cognitive Impairment.

4. DISCUSSION

About the pathogenesis on the cerebral tissue level, multiple process contributes for VCI/VaD development. The relation between Cerebrovascular Diseases (CVD) and VCI in VaD, as its pathogenesis, is not well understood, Love and Miners (2017).

VCI refers to all cognitive deficit due to CVD, no matter the mechanism responsible or occurrence of stroke. On this context, VaD is characterized as a cognitive neurologic disease that also integrates behavior and locomotor symptoms, as parkinsonian gait disorders, dysarthria, and autonomic dysfunction, Smith (2017).

The causes of VCI are classified in three categories according to the structures involved on the vascular disease: cardiac, small vessels and large vessels disease, Smith (2017). In this way, when the VCI cases are evaluated, the disease of small vases appears to be the most frequent cause, which can be subdivided in two mean classes that have in common the stenosis of the arteriole. However, it is not known if the cause of this narrowing of the vascular lumen is related directly with the pericytes activity, which are important to maintain the blood brain barrier and for the regulation of the perfusion and vascular linkage in capillary level, Love and Miners (2017).

The small vessels disease can be further divided in two main classes: The Non Amyloid-Small Vessels Disease (NA-SVD), related to arteriosclerosis caused by hypertension, aging and other vascular risk factors; and Cerebral Amyloid Angiopathy (CAA), resulting from amyloid accumulation in small arteries between the meninges and the cortex, Smith (2017).

Moreover, the first stages of VCI are difficult to distinguish, because the symptoms overlap with other causes of cognitive impairment, as normal pressure hydrocephalus, Parkinson's disease and AD. Lang et al (2017).

Refering to the elderly, its relevant to say that CAA is the most common cause of cognitive impair-

ment. Clinically, the cognitive deficit relates to attention, process of information, executive memory, language, humor and motivation, Ferrari et al (2017).

An important matter to be evaluated and argued during the clinical trials are the pre-existing comorbidities, as well as the verification of others concomitants dementia cases, as AD. This strict control of the diagnosis is important because the pathologies commonly may not be excluded with the necessary certainty, which makes difficult to classify the mechanism of the CVI, Smith (2017).

Occasionally, the patients with VCI may come back to normal, especially when cognitive deficits occurred because of stroke depression, cardiac insufficiency or autoimmune disturbs. In this way, the global evaluation of the patient is necessary to identify possible situations that may simulate or cause the transitory VCI. Fisher et al (2018).

In Figure 1, the pre-pathogenic, remounting the general risk factors, and pathogenic phases are portraid. It's important to say that the insufficient amount of data about the physiopathology of the VCI, a spectrum that ranges from Vascular Mild Cognitive Impairment to VaD, Fisher et al (2017), has multiple causes, including the lack of post-mortem diagnosis validation and in vivo confirmation of VaD per se; the suppression of cases with neurodegenerative disease by overlapping with VCI/VaD; the lack of organization of the neuropathological evaluation in the diagnosis protocols for vascular disease. Love and Miners (2017). It is important to emphasize that the absence of exact epidemiological data about VaD makes it impossible to develop researches related to the quantitative contribution of the vascular disease for VCI, once the references are based on non-valid clinical evaluations. Love and Miners (2017).

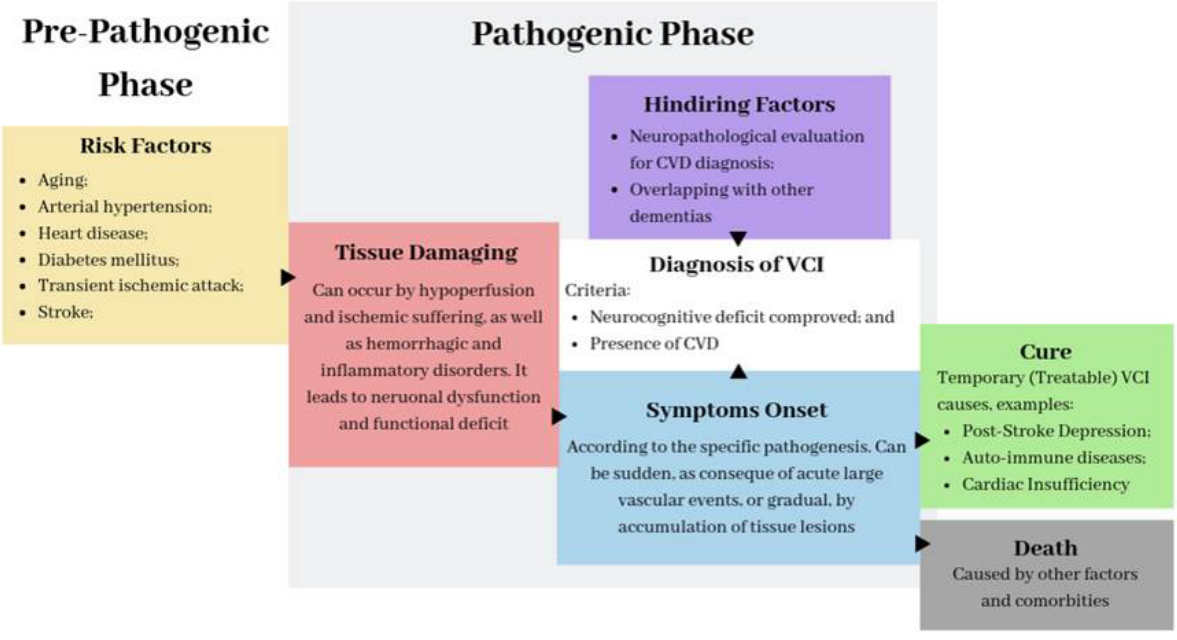

Figure 1 – Vascular Dementia Natural History. The lacking of physiopathology enlightening makes difficult to stablish a chronologic sequence, as well as the heterogeneity of presentation and causes, but there are still some common and confirmed information, like risk factors, necessity of confirmation of VCI, the specter on symptoms onset and basic pathologic features leading to damage. VCI – Vascular Cognitive Impairment; CVD – Cerebrovascular Diseases.

5. CONCLUSIONS

The VaD is considered a cognitive disorder that incorporates behavioral symptoms and locomotor system abnormalities. The definition of the neuropathology and the clinical effects of VaD depends on the correct clinical information and the pathological examination. The repercussion of vascular disease in cognition is already known, but recent studies and advances in neuropathology, genetic and epidemiology have helped to deeply understand the VaD and its relation with VCI. The comprehension of all these aforementioned factors, as well as the patient's overall clinical presentation, like pre-existing comorbidities, is substantial to the properly management of the VaD.

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