

## Why Should We Must Evaluate Cognitive Function in Hypertensive Patients?

Augusto Vicario\*, Gustavo H. Cerezo

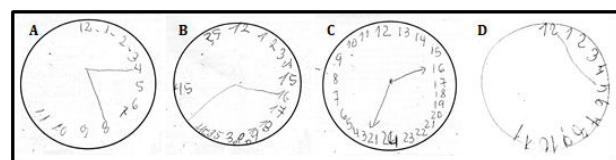
Department of Cardio Vascular Prevention, ICBA-Cardiovascular Institute, Buenos Aires, Argentina

### DESCRIPTION

Hypertension and dementia are two highly prevalent pathologies that affect the brain in the same period (persons over 60 years). One-third of patients with dementia have hypertension and, hypertension was reported in two-third of patients 65 years and older with dementia [1]. Thus, the brain is a target organ for hypertension and hypertension is the main modifiable vascular risk factor for developing cognitive impairment, dementia or Alzheimer's disease. Among the vascular risk factors, hypertension is the main cause of small vessel disease (leukoaraiosis, lacunar infarcts, microbleeds and dilated perivascular spaces) that mainly affects the cerebral subcortex. Vascular brain damage (hypoperfusion, hypoxia, ischemia, brain-blood barrier disruption) affects the neurovascular unit (vascular, oligodendrocytes and neurons) and demyelinates the association fibers in the most vulnerable regions of subcortex (periventricular area has high density of long associating fibers), disconnecting the cortico-subcortical association circuits. The dorsolateral prefrontal cortex and the nuclei of the base is the most frequently circuit affected, resulting in impairment of executive functions [2].

Thus, the cumulative cerebrovascular damage hypertension-mediated is the link between the risk factor (hypertension) and the different forms of clinical expression or phenotypes (stroke, cognitive disease, dementia or Alzheimer's disease). The Europeans (European Society of Hypertension and European Society of Cardiology) [3] and Latin American (Argentine Federation of Cardiology, Argentine Society of Cardiology and Argentine Society of Hypertension) [4,5] Guidelines on diagnosis and treatment of hypertension, different statements (American Heart Association, American Stroke Association) [6,7] and paper position (Working Group Hypertension and Brain-ESH)1 and others more, have shown that "hypertension in the midlife is a risk factor of cognitive impairment and dementia in the late life" and recommending the evaluation of cognitive status in hypertensive patients 65 years and older, with high risk or cognitive complaint. However, the brain and its vascular damage hypertension-mediated is not considered in the classification of the cardio and cerebrovascular risk of the hypertensive patient, being unintentionally ignored. Brain

vascular damage can be observed on brain Magnetic Resonance Scans (MRI) as white matter hipertintensivies, microscopic hemorrhages or necrosis, however, the use of MRI scan as a screening method is unthinkable for economic and practical reasons and, mainly due to ignorance of the "threshold" due to above which the "burden" of white matter lesions results in cognitive dysfunction. Not all patients with WML present cognitive impairment and this responds to the fact that there are other factors that determine its clinical expression (age, location, type and extending of lesions, presence of secondary neurodegeneration, resilience or cognitive reserve and pre-morbid risk and co-morbidities among others) [8]. So then, relationships between vascular lesions and symptoms are highly variable, so considering the functional (cognitive) damage of the brain rather than determining the anatomical damage could be more important for early detection and develop different interventions that reverse or slow down the progression of the cognitive impairment. Some research shows that 30% of hypertensive patients present brain vascular damage without heart or kidney damage [9]. On the other hand, in investigations carry out by our research group we have observed that one-third of hypertensive patients present cognitive dysfunction that involves the executive functions domain. Thus, to know the cognitive status in hypertensives patients could be an adequate "surrogate" or potential "biomarker" of the brain vascular damage hypertension-mediated (Figure 1).



**Figure 1:** Brain vascular damage hypertension-mediated.

Examples. A. Impaired of executive component (the draw of the numbers shows a gap and placement incorrect position). B. Impairment of executive component (more than 12 numbers and shows the gap between them). C. Impairment of executive component (more than 12 numbers and sequence of numbers are incorrect). D. Impairment of semantic component (the

**Correspondence to:** Vicario A, Department of Cardio Vascular Prevention, ICBA-Cardiovascular Institute, Buenos Aires, Argentina, E-mail: [augusto.vicario@gmail.com](mailto:augusto.vicario@gmail.com)

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numbers grouped on one side and drawn only one hand placement on others numbers).

Many neuropsychological test (Mini-mental test, Trial making test, Stroop test, etc) or neuropsychological test batteries (MoCA test, Cambridge Cognitive test, etc.) are used to identify cognitive impairment and all of them share similar sensitivity and diagnostic specificity. The time of administration of this tests or tests batteries ranges from 20 to 30 minutes and in something cases require it the interpretation by neuropsychologist of their results. It is so that, to identified a simple, quick and easy to administer cognitive test that can be implemented in routine clinical practice to detect cognitive dysfunction in hypertensive patients could be a screening test would allow us to recognize those patients who could benefit from some interventions that reverse or slow down progression cognitive impairment.

We studied the cognitive status in more than 4000 hypertensive patients in different samples and we observed the usefulness of the clock drawing test to detect cognitive impairment [10-13]. In the latest study published on this year, the clock drawing test detected cognitive impairment in 36% of a sample 1414 hypertensive patients and even more in the 29% of the participants with normal MMSE (>24 points) [14].

The qualitative analysis of the clock drawing test has allowed the result to be divided into 2 components: the executive component of the test (drawing of the numbers and correct location in the circle) and the semantic component (drawing of the hands indicating the twenty minutes to four). We have found that the executive component of the clock drawing test is associated with the attention and visual construction (overlapping pentagons) proofs of the MMSE test and, the semantic component is associated with the Boston Naming test (abbreviated) and semantic verbal fluency (not published data). Compared with the MMSE, the TR detects more cognitive dysfunction (executive dysfunction) in young adults hypertensive patients than in elderly or very elderly patients and its results are not affected by the presence of behavioral disorders such as anxiety or depression. On the other hand, the clock drawing test allows to establish severity and its easy administration makes it a useful tool to evaluate the progression and evolution of cognitive compromise over time. Thus, the Clock drawing test could be used as a simple screening test to assess the cognitive status in hypertensive patients with probable brain vascular damage as manifestation of target organ damage hypertension-mediated.

## CONCLUSION

In conclusion the cognitive impairment could be considered such a “surrogate” of the brain vascular damage as target organ in hypertensive patients and the clock drawing could be a good screening test for used in the clinical routine practice.

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