



# Benefit of Cognitive Stimulation Therapy in a Patient with Vascular Dementia: A Case Report

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## Abstract

**Edited by:** Branislav Filipović  
**Citation:** Soedirman BS, Laksmidewi AAP. Benefit of Cognitive Stimulation Therapy in a Patient With Vascular Dementia: A Case Report. Open Access Maced J Med Sci. 2021 Jan 10; 9(C):10-14. <https://doi.org/10.3889/oamjms.2021.5585>  
**Keywords:** Vascular dementia; Cognitive stimulation therapy; AD-8; Coronavirus disease-19  
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**Received:** 22-Nov-2020  
**Revised:** 05-Dec-2020  
**Accepted:** 20-Dec-2020  
**Copyright:** © 2021 Billy Salvatore Soedirman, Anak Agung Ayu Putri Laksmidewi  
**Funding:** This research did not receive any financial support  
**Competing Interests:** The authors have declared that no competing interests exist  
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**BACKGROUND:** Cognitive stimulation therapy (CST) is a restoration therapy based on cognitive improvement of patients, by giving patients a variety of stimulation. This therapy is highly recommended for people with mild dementia from mild to moderate in either Alzheimer dementia or vascular dementia. Vascular dementia is a collection of symptoms of decreased cognitive abilities associated with the incidence of stroke.

**CASE REPORT:** Reported a 76-year-old man, who had a bleeding stroke, in admission the patient were often angry, sleepless, and aphasic. After returning home the patient experienced impairment in memory, language, executive ability, mild to moderate degree of visuospatial and incapable to manage his daily activities, therefore in routine evaluation of the 3<sup>rd</sup> month, patient was diagnosed as Vascular cognitive impairment. On regular home visits until the 6<sup>th</sup> month after the stroke, it was reported that in the first 6 months had been received CST. However, in the 7<sup>th</sup>–9<sup>th</sup> month of CST because at the time of the coronavirus disease-19 pandemic, human interaction was severely restricted, so patient monitoring was carried out using Ina AD-8 through phone. An evaluation of the cognitive function by measuring the cognitive function of the patient was using the Indonesian version of Montreal Cognitive Assessment (MoCA-Ina), as well as using activity daily living and instrumental daily living activities to measure the patient's independence function. After 6 months of CST, there were cognitive improvements and were seen in MoCA – Ina, Ina AD-8 followed by improved patient independence.

**CONCLUSION:** Cognitive stimulation is the best intervention option in the treatment of mild to moderate vascular dementia. This case is one good example that shows the success of CST that has been observed for 9 months, not only on the cognitive component but also in terms of the ability to perform daily activities.

## Introduction

Dementia is a disease which is associated with an increase of age and vascular disorders of the brain. Globally, the elderly population continues to increase, throughout Asia and Indonesia from 2015 has entered the era of aging population because the population aged 60 years and above exceeds the figure of 7%. The prevalence of dementia in 2015 amounted to 1.2 million cases and will continue to increase to 3,980,000 by 2050. From data taken from the United States in 2002 vascular dementia is estimated at 0.98% at age 71–79, 4.09% at age 80–89, and 6.10% at age >90 years, out of all 594,000 cases [1]. Although Alzheimer dementia is still the number one cause in western countries, vascular dementia is still considered the most common cause of dementia. The number of ischemic stroke sufferers is much greater than stroke bleeding, but the risk of dementia in stroke bleeding is greater compared to stroke blockages. Male gender and elder are still major factors that play a role in dementia in stroke [2], [3].

In hemorrhage stroke the incidence of dementia can be as much as 28% in 4 years, and most occur in patients who have damage of amyloid blood vessels

(cerebral amyloid angiopathy). The latest classification of Vascular Impairment of Cognition Classification Consensus Study divides the incidence of cognitive impairment which after vascular events can be divided into 2 types, major and minor vascular cognitive impairments (VCIs). Major cognitive impairment or can be referred to as vascular dementia is the disorders in at least 1 of 5 cognitive areas that cause instrumental impairment of daily activity (activity daily living [ADL]) or instrumental activity daily living (IADL), while cognitive impairment that occurs within 6 months after stroke and does not improve is referred to as post-stroke dementia. Five cognitive domains include executive function, attention, memory, language, and visuospatial function [4], [5]. Montreal Cognitive Assessment (MoCA) is a neuropsychological instrument that contains all five cognitive areas and has been translated into several languages. However, there are still limitations in the assessment of neuropsychological instruments, especially in the acute phase of stroke, where most patients experience delirium [6], [7].

Post stroke dementia (PSD) can cover all types of dementia that occur after a stroke that can occur in one-third of surviving stroke patients [8]. Risk factors from post-stroke dementia include genetic factors, demographic factors such as old age and low

education, transient ischemic attack, vascular factor risk, and diagnosis of post-stroke dementia should be waited up to 6 months after stroke [9], [10]. The most impact on cognitive function suffered by patients with VCI was on areas of executive function and attention compared to memory [3]. Stroke patient over the age of 65 years of PSD incidence between 1% and 4% patients and their prevalence will increase twice every increase 5–10 years [6], [7]. The clinical manifestation of vascular dementia can be varies depending on the size, location, and type of stroke. Brain damage in stroke patients in 20–50% of patients will experience memory impairment as well as attention, thinking speed, and executive function [11].

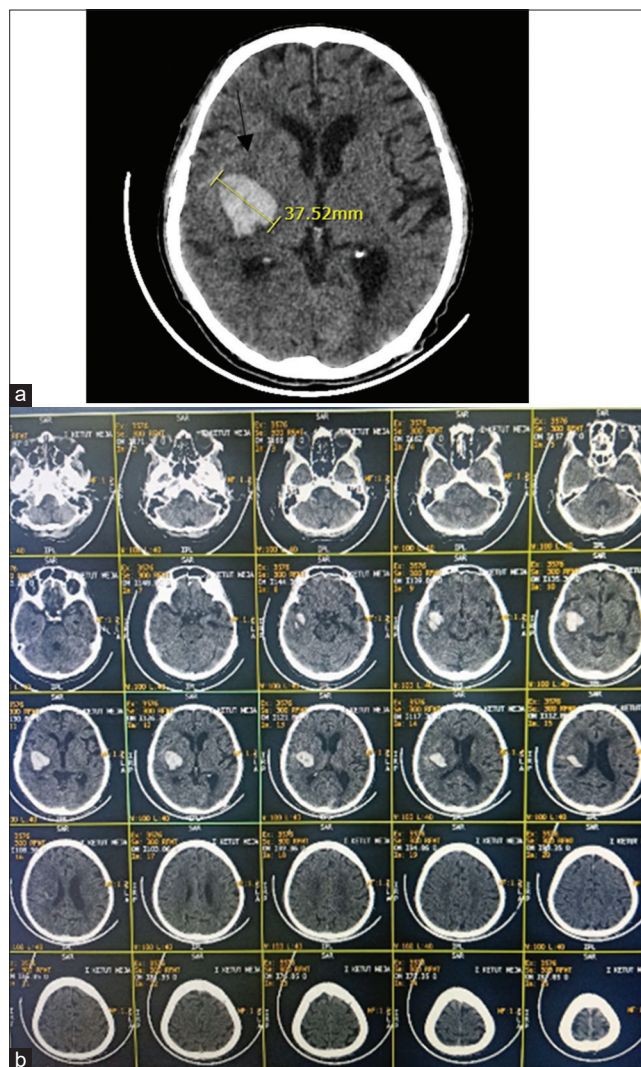
Cognitive stimulation therapy (CST) is non-pharmacological intervention methods widely applied in mild to moderate dementia patients. Interventions are usually performed in a group containing multiple sessions containing group activities and word installation [11]. This intervention aims to give the patient the courage to answer the questions given, thereby stimulating the patient in his environment will increase his social power. Interventions are usually carried out by people trained in various installations of either a home, a daycare home or a memory clinic. In conjunction with cognitive improvements cognitive stimulation provides a good improvement on the dimensions of language. Learning on cognitive stimulation primarily encourages patients to dare to give ideas and opinions that can improve language relationships, and this can improve the patient's quality of life.

## Case Report

A 76-year-old man came to the Emergency room with a left half-body weakness accompanied by headaches 3 h before admission, slurred speech, face drooping, and vomited. Hypertension disorders, diabetes mellitus and heart diseases do not exist before. Blood pressure 180/110 mmHg right and left, heart rate 85 beat per minute regular, body temperature 36.7°C, breathing 18 beat/min, and numerating pain scale 5/10. From a neurological examination obtained. Glasgow coma scale Eye 4, Verbal 4, Motoric 5, and funduscopy found retinopathy hypertension Scheie 1, cranial nerve paralysis VII and XII sinistra UMN, and sinistra flaccid hemiparesis with motor grade 2. Clinically assess as hemorrhagic stroke.

**Table 1: Laboratory test results at the beginning of a stroke patient [12], [13]**

Examination	Results	Reference
Fasting blood sugar	103 mg/dL	110–125 mg/dL
Blood sugar 2 h after eating	119 mg/dL	<200 mg/dL
Total cholesterol	215 mg/dL	>200 mg/dL
LDL	162 mg/dL	160–189 (High)
HDL	59 mg/dL	Low<40
Triglyseride	74 mg/dL	<150 mg/dL (normal)



**Figure 1: (a and b) Picture of computed tomography scan of the brain without contrast, showing a picture of bleeding in the right basal ganglia area with a blood volume of about 21.9 ml, with pericentral edema of the right lateral ventricle, as well as anterior and posterior horns**

NIHSS score 10 and Hachinski score 11. Blood examination within normal limits (Table 1) after undergoing a computed tomography scan of the head without contrast seen an image of intracerebral bleeding (Figure 1) does not appear to be bleeding in the cortex or brain stem area, and there is no history of memory impairment before.

During the 14 days of treatment at the hospital the patient still experiences headaches, difficulty in fall a sleep and still seems agitated, and patients are often angry. Hachinski's patient score is 11, which means, this patient is a VCI. After outpatients consume citicoline 2 mg × 250 mg and captopril 3 mg × 50 mg. Citicoline is only consumed for 3 weeks after a stroke.

Three months after stroke, the weakness of his limb improves hence the patient can already stand and walk even though it is still bleed. The patient starting to speak and to communicate but the patient is not able to do daily activities on his own due to his paralysis.

Patients still rely on families to prepare food and prepare clothes. Everyday patients are more likely to watch television and fill in puzzles. Patients also sleep more. Patients still have difficulty remembering goods and are often wrong to remember people, as well as often miscreant items. At MoCA-Ina examination (MoCA Indonesia) patients got a score of 14 out of a total value of 30 (Table 2) and brief memory and executive task (BMET) (Table 3) got score of 6, which means the patient has VCI [7]. Assessments of daily activities using ADL and IADL obtained ADL 8 and IADL 7 in results. On examination using clinical dementia rating scale found a score of 1 which means mild dementia, while from the examination with the test 4A's get 2 points which means cognitive impairment. Patients were given donepezil 1 mg × 5 mg (cholinesterase inhibitors) but because the patient felt side effects in the form of heart palpitations and often tiredness, then the patient did not continue treatment. Patients received CST every month until 6<sup>th</sup> month.

**Table 2: Improvement on the second evaluation after 6 months of stroke, there were improvements in the neuropsychology test MoCA-Ina, in the area of attention (+2 points), language (+1 point), and orientation (+1 point), while the areas that remained distorted were visuospatial, abstraction, memory, and recall. At 9 months after stroke used Ina AD8 assessment**

Evaluation 1 (3 months after stroke)	Evaluation 2 (6 months after stroke)
Visuospatial 2/5	Visuospatial 2/5
Attention: 3/6	Attention 5/6
Language 1/3	Language 2/3
Abstraction 1/2	Abstraction 1/2
Naming 3/3	Naming 3/3
Memory 0/1	Memory 0/1
Recall 2/ 5	Mengingat Kembali 2/ 5
Orientation 2/6	Orientation 3/6
Additional score: 1 (formal education ≤12 years)	Additional score: 1 (formal education ≤12 years)
Total score 14/24	Total score 17/24

MoCA: Montreal cognitive assessment

Patients each month are taken to Neurobehavior Clinic at Sanglah Central Hospital for cognitive stimulation and nonpharmacologic therapy. In evaluation on 6<sup>th</sup> month, there was an improvement in MoCA-Ina score to 17 (Table 2) and BMET rating got a value of 8 (Table 3) [7], and on daily activities measured by ADL and IADL instruments obtained ADL 3 and IADL 5 scores.

**Table 3: BMET table showed improvements, especially in orientation components (+2 points), attention (+2 points), and language (+2 points)**

Evaluation 1 (3 months after stroke)	Evaluation 2 (6 months after stroke)
Orientation: 0/2	Orientasi: 0/2
Repetition: 2/2	Repetition: 2/2
Letter – number matching: 1/2	Letter – number matching: 1/2
Motor sequencing 0/2	Motor sequencing: 1/2
Letter sequencing: 0/2	Letter sequencing: 1/2
Number – letter sequencing: 1/2	Number – letter sequencing: 1/2
Delayed recall: 1/2	Delayed recall: 1/2
Delayed recognition: 0/2	Delayed recognition: 1/2
Total Score: 6/16	Total Score: 8/16

BMET: Brief memory and executive task.

When coronavirus disease (COVID)-19 pandemic outbreak patients were unable to visit hospital, then patients were evaluated by phone using questionnaire Ina AD-8. Within 2 months of development, the patient obtained an Ina AD score 4.

While in the house, the patient is trained by his own family using pictures and by remembering his family.

## Discussion

Vascular dementia occurs in 30% of stroke patients, characterized with cognitive impairment and impaired daily activities. Cognitive impairment found in patients, it is caused by many risk factors, there are several risk factors that make it susceptible to dementia, such as age above 65 years, male, chronic high blood pressure, high blood pressure alone is a risk factor for both vascular and Alzheimer dementia, but the mechanism is unclear [14]. Systolic blood pressure above 140 mmHg at the age of 71–93 years can raise the risk 1.77 times higher [15]. However, in Connors research *et al.* in 2016 in 4.3 million people found no significant relationship between high blood pressure and vascular dementia [16]. However, in its conclusion, it is said that a decrease in blood pressure can lower the risk of vascular dementia. While in dyslipidemia from the study, there has been no direct evidence between dyslipidemia and VCI, and in one study mentioned, the decrease in HDL and the increase in LDL had a weak effect on the incidence of vascular dementia [17], [18].

VCI, according to AHA in 2017, including all forms of cognitive decline from mild cognitive impairment to dementia. Pasien with VCI will usually return to normal cognitive conditions, and 20% of VCI sufferers will return after some time after the stroke event [19], [20]. Other studies reported 29% of patients with hemorrhagic stroke developed into dementia and were higher in cortical intracerebral bleeding than subcortical, despite these patients had subcortical bleeding [18].

CST is described as a cognitive-based intervention that emphasizes on improving cognitive function and social functioning. It is usually done in a group with or without a caregiver. Woods in 2012, which combined data from 15 randomized control trials studies, CST gives significant numbers of cognitive improvements compared to regular activity. In addition to showing cognitive improvement, this therapy also showed improvements in communication and social interaction fields [21], [22].

Although in research conducted by Woods, 2006 and Spector, 2003, it was said that better improvements were found in women than men [23], [24]. Research conducted by Piras *et al.*, in 2017, on CST in mild-degree vascular dementia patients was found to be improvements in the dimensions of short memory, finger countdown, and patient quality of life [23], [24].

In post-stroke dementia, there can be various forms that can be affected by ischemic type as well as intracerebral bleeding, so it can cause variations in the



occurrence of dementia and its association with stroke events. In the case of reported on neuropsychological examination with MoCA-Ina from 3<sup>rd</sup> months after stroke obtained total score of 14 and MoCA-Ina results in the 6<sup>th</sup> month obtained changes to a total score of 17, with improvements mainly in the area of attention, language, and orientation. BMET evaluation has improvements in both executive function components and memory functions. While the area of visuospatial, abstraction, naming, and memory has not shown any meaningful changes. In this case, the clinical manifestations of the patient correspond to the description of subcortical lesions in the non-dominant hemispheric (right) which during treatment undergoes agitation, visuospatial disorders of patients who are unable to recognize the family and mis recognize the goods. The anger issue disappeared 2 months after stroke, this condition correspond to the possibility of lesions on the globus pallidus [19], [25]. Based on a systemic study from Chan Tiel in 2015, emotional and psychomotor disorders are symptoms often seen in VCI. From the evaluation of the 3<sup>rd</sup> month and the 6<sup>th</sup> month, it can be said that in this patient there are a clinical changes in the cognitive component as well as the daily activity of the patient, and there is no worsening from symptoms within the period of 3 months of evaluation (Table 4).

**Table 4: Comparison between neurobehavior test at the 3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> month (during COVID-19 pandemic)**

Examination	3 <sup>rd</sup> month	6 <sup>th</sup> month	9 <sup>th</sup> month
MoCA-Ina	14	17	
BMET	6	8	
ADL	7	5	
IADL	8	3	
4A's	2	2	
Ina AD-8	7	5	4

COVID: Coronavirus disease, ADL: Activity daily living, IADL: Instrumental activity daily living, BMET: Brief memory and executive task.

Evaluations performed at the 3<sup>rd</sup> month after stroke and 6<sup>th</sup> month after stroke found minimal changes in reliance on daily activities evaluated with ADL and IADL, found improvements along with correction of patient's cognitive function. In the second evaluations up to the 6<sup>th</sup> month after stroke, the patient continued to show cognitive impairment as well as impairment in daily activities, although there was improvement in the second evaluation, it can be concluded that this patient has vascular dementia. Acute confusional state in stroke can be excluded using 4A's test [21].

Ina AD-8 is an Indonesian version of AD-8 that is asked to the informant or by the person that closest to the patient, which contains 8 questions about how the patient's condition, with a score above or equal to 2 means that the patient suffers from dementia. At the time of the COVID-19 pandemic, a large-scale social restriction was imposed hence patient could no longer visit the Neurobehavior Clinic and could not undergone cognitive stimulation, therefore to find out the cognitive condition of the patient used a telephone-based questionnaire with the family as an informant, then got a score of 4 from the previous score of 7. From research conducted by Plassma *et al.*, in 2007, in the

United States mentioned that vascular dementia can experience slow thinking, forgetfulness, disorientation, impaired in solving problems and planning things, and making explanations, hence from family-based assessments patients can see cognitive improvements that occur in memory components, explanations, and problem solving [25], [26].

## Conclusion

A 76-year-old man – suffered a hemorrhagic stroke in the right basal ganglia area. Patients are seen to experience cognitive decline, such as often forgetting after putting something in, difficulty solving problems, not being able to run hobbies properly, and relying on others to do daily activities. Within 6 months, the patient received cognitive stimulation therapy several sessions, found improvements in cognitive function as well as ability in the daily activity. Patient has been followed for 9 months and been evaluated at 3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> month. In the middle of the year, since there were an outbreak of COVID-19, and the city was being restricted to visit at home, the patient was evaluated using Ina AD-8 by phone on the 9<sup>th</sup> month after the stroke, and found improved cognitive function and better self-reliance. Cognitive stimulation is the best intervention option in the treatment of mild to moderate vascular dementia. This case is one good example that shows the success of CST that has been observed for 9 months, not only on the cognitive component but also in terms of the ability to perform daily activities.

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