CASE REPORT

Reversed Clock Drawing Phenomenon in a Patient with Vascular Dementia and *Vascular parkinsonism*: A Case Report

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ABSTRACT

Reversed Clock Phenomenon (RCP) occurs when the numbers are drawn counterclockwise in a clock drawing test. It is commonly associated with the decline in visuospatial function in dementia associated with lesions in the right cerebral hemisphere. While RCP typically manifests in the acute phase, this case reported a 64-year-old man with vascular dementia (VaD) and *vascular parkinsonism* who had exhibited persistent RCP one year after his last stroke. He presented with worsening memory impairment and frequent episodes of falls following recurrent strokes in 2018 and 2020. His Clinical Dementia Rating (CDR) was 1. MRI of the brain showed a hypodense lesion at the bilateral temporoparietal lobes. After treatment with acetylcholinesterase inhibitors and rehabilitation, his condition improved, suggesting the potential benefits of this combined approach in managing persistent RCP and visuospatial deficits in vascular dementia.
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INTRODUCTION

The Clock Drawing Test (CDT) is a simple and straightforward screening approach used as a cognitive assessment tool to detect dementia. CDT is often paired with other assessments, such as the Mini-Mental State Examination (MMSE) or Montreal Cognitive Assessment tool (MOCA). The individual is required to draw a circular clock face with numbers from one to twelve in the correct order, then set the hands to ten past eleven. Scoring assigns two points for a correctly drawn clock and zero for an abnormal one.

One unusual finding in the CDT is the Reversed Clock Phenomenon (RCP), in which the numbers are written in reverse order or counterclockwise (1). RCP is often linked with visuospatial and executive function deficits, which are typical in neurological and neurocognitive disorders.

In this report, we present a rare occurrence of an older patient who exhibited the RCP that persisted even one year after a stroke. This highlights the importance of CDT and its potential role in understanding and diagnosing cognitive impairment.

CASE REPORT

We present a gentleman in his 60s with a medical history of hypertension, dyslipidaemia, stage 3 of chronic kidney disease and recurrent strokes in 2018 and 2020. He presented with gradual forgetfulness for three years, which worsened over two months. He was seen in our geriatric outpatient clinic in March 2021, about one year after his last stroke. Collateral history was obtained from his wife, who is the primary carer.

He was able to perform basic and instrumental daily living activities independently, like bathing, eating, and handling computer tasks. His mobility was aided by a walking frame due to instability. He had multiple episodes of falls, and he complained of difficulty standing up. Recently, he had developed urinary incontinence and often wandered around at night. His wife noticed that he was also more anxious and became easily irritated.

Clinically, the patient presented with a shuffling gait and lead pipe rigidity in the upper limbs, intact cranial

nerves and motor function, and no cerebellar signs. Examination of other systems was unremarkable. He scored 24/30 in the Folstein MMSE, and we noticed that he had a reversed clock phenomenon for CDT (Fig. 1). His Clinical Dementia Rating (CDR) was 1, indicating mild dementia.

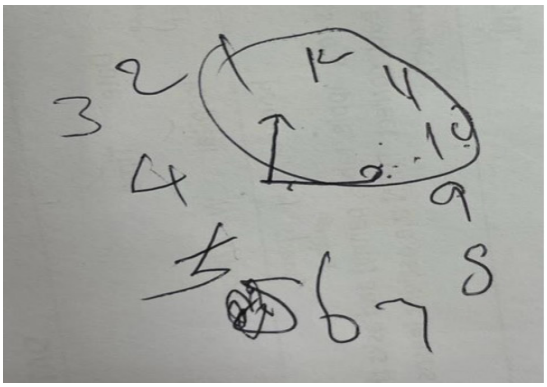

Fig. 1: clock drawing test on presentation

Further history taken from the wife revealed that he had a reversed memory of the position of the rooms in the house. When asked to draw a map of his home, a few rooms and furniture in the house were placed in the opposite direction.

Blood analyses demonstrated a normal complete blood count, renal profile, and hepatic function. No lumbar puncture was done. MRI of the brain disclosed widespread atrophy, particularly at the bilateral temporoparietal lobes, with hypodense lesions observed over the bilateral centrum semiovale, bilateral corona radiata, periventricular, and bilateral external capsules, indicative of small vessel disease. There was no hydrocephalus (Evans index = 0.29, Callosal angle 121.7°)(Fig 2(a-b))

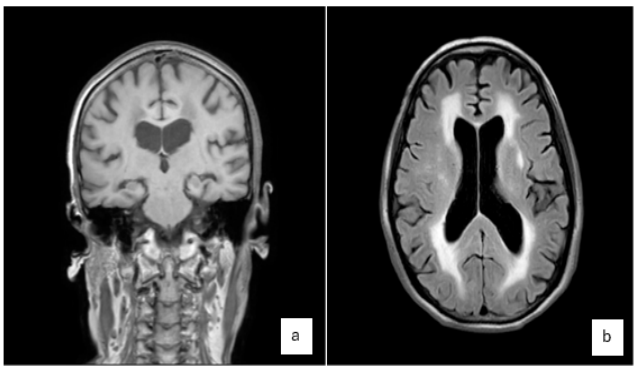

Fig. 2: (a) MRI Brain T1 Coronal view -widening of choroid fissure and temporal horn of the lateral ventricle. (b) MRI Brain AXIAL FLAIR- Periventricular hyperintensities

We diagnosed him with Vascular Dementia and *Vascular parkinsonism* and started him on an acetylcholinesterase (AChE) inhibitor and L-Dopa therapies. He was then referred to physiotherapy and occupational therapy for cognitive rehabilitation sessions. Subsequently, his condition improved, and the RCP manifestation was resolved (Fig 3).

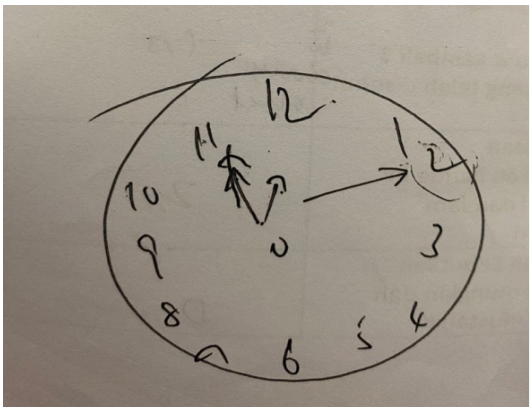

Fig. 3: Clock drawing test after intervention

DISCUSSION

The Reversed Clock Phenomenon (RCP) is a phenomenon in which the numbers 1–12 are written counterclockwise. The error in arranging the numbers on the clock arises from spatial and planning impairments commonly associated with neurocognitive disorders such as dementia (1). This visuospatial dysfunction is often linked to frontal and temporoparietal disturbances, particularly in Alzheimer's Disease. However, abnormal results in the Clock Drawing Test (CDT) have also been observed in various neurological conditions, including stroke, Parkinson's disease, and space-occupying lesions. RCP is notably more prevalent in Parkinson's disease with dementia, diffuse Lewy body disease, and vascular dementia due to the involvement of subcortical regions.

In patients with stroke, RCP can be a recognisable sign of impairment. Our patient's MRI revealed small vessel disease with a hypodense lesion predominantly affecting the bilateral cerebral hemispheres. The involvement of both temporal and parietal lobes was significant as these areas are commonly linked to visuospatial processing, planning, and orientation. Similar findings were noted by Brugnolo and colleagues, who used brain single-photon emission computed tomography (SPECT) to examine dementia patients exhibiting RCP (2). Their study reported hypoperfusion in the bilateral temporal cortex, particularly in the right and medial temporal lobes.

While most studies associate RCP with right hemisphere lesions, some also link it to left hemisphere damage, though the anatomic basis for this phenomenon remains poorly understood. Lesions in different regions may affect neural network components responsible for spatial mapping, leading to RCP. This complexity suggests that RCP may not be exclusively linked to right hemisphere damage but could arise from more widespread disruptions in the brain's spatial and cognitive systems, as evidenced in patients with vascular dementia and recurrent strokes.

Visuospatial errors are more common in patients with

right hemisphere damage, while time-setting errors tend to occur in patients with left hemisphere lesions (3). Our patient also demonstrated disturbances in mental space representation, such as reversed memory of room positions, suggesting bilateral medial parietal region involvement. This region is linked to egocentric navigation, which may explain his spatial disorientation. In addition to RCP, this reversed memory of room positions further emphasised the extent of cognitive impairment, suggesting damage beyond isolated areas, possibly affecting the brain's spatial representation and executive functioning networks. This spatial disorientation, which persisted a year post-stroke, reflected the severity of the cerebral involvement.

Typically, RCP tends to be prominent in the acute phase and gradually resolves. However, in our patient, the RCP persisted even after a year of the last diagnosis of stroke. His situation could be related to the broader localisation of the stroke and its severity. Persistent RCP has been reported in other cases, such as an 88-year-old woman with mild cognitive impairment (MCI), where the phenomenon persisted for three years(4). Her MRI revealed small, deep white matter hyperintensities and severe yet symmetric expansion of the frontal-parietal subarachnoid spaces. The mechanisms involved in the recovery of neurological function post-stroke remain not fully understood.

Although no approved drug is available for vascular dementia, studies suggest that acetylcholinesterase inhibitors like Donepezil may offer cognitive and functional benefits (5). They have been shown to provide substantial benefits in cognition, overall function, and enhancement in activities of daily living (ADL) in patients with various forms of dementia, including vascular dementia. In our case, our patient responded to a low dose of Donepezil and rehabilitation, with significant improvement in cognitive and visuospatial function.

While the literature presents mixed results on the use of Donepezil in vascular dementia, our patient's positive response reinforces its potential as a therapeutic option, especially when combined with targeted rehabilitation. Additional data also support the safety and effectiveness of Donepezil in treating Vascular Dementia, making it a viable treatment option for patients facing cognitive decline (5). Considering the burden and effect of dementia on the quality of life, a safe and effective treatment should be considered for these patients.

CONCLUSION

This case highlights the persistence of the Reversed Clock Phenomenon (RCP), especially in severe or extensive bilateral cerebral lesions. Unlike the more typical right hemisphere involvement, bilateral lesions can result in prolonged visuospatial deficits in patients with vascular dementia. Additionally, the patient's significant improvement following a combination of acetylcholinesterase (AChE) inhibitors and a targeted rehabilitation program demonstrates the potential synergy between pharmacological and rehabilitative interventions. This case reinforces the importance of a multidisciplinary approach in managing complex dementia cases to optimise patient outcomes.

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