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Recurrent transient heading disorientation heralding acute posterior cerebral artery (PCA) infarction

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ABSTRACT

Objective Heading disorientation is a type of pure topographical disorientation. Reported cases have been very few and its underlying mechanism remains unclear. We report an unusual presentation of a 60-year-old man with recurrent transient heading disorientation heralding an acute posterior cerebral artery infarction.

Design Case report.

Conclusion Acquired injury to the right retro-splenial region can result in a specific variant of topographical disorientation known as heading disorientation that may present as an atypical transient ischaemic attack-like symptom heralding acute cerebral infarction.

INTRODUCTION

Topographical disorientation refers to the inability to navigate one's way within locomotor environment. Available published material has allowed a comprehensive taxonomy and classification of topographical disorientation disorder to be proposed relating to damage of distinct neuro-anatomical areas.[1] Heading disorientation is a distinct variant of topographical disorientation where one is unable to derive directional information from landmarks to reach a destination. It is a very intriguing symptom; however, reported cases have been limited with very few specific tests to diagnose it. Here, we report an individual who presented with recurrent heading disorientation that heralded acute posterior cerebral artery infarction (PCAI) highlighting it as an unusual transient ischaemic attack (TIA)-like symptom.

CASE PRESENTATION

A 60-year-old right-handed chef, who had been under treatment for diabetes mellitus and hypertension was driving his car on his usual way back home from work. When he stopped at a traffic light, he suddenly lost his sense of direction back home. However, he could still recognise buildings and road signs that were familiar to him. He was aware that he was somewhere near his house but unable to determine which direction he should drive. After making a few wrong turns along the way, he finally reached home. He needed more than an hour to travel home from a place where he usually needed 10 min by car. His wife noted something was amiss and immediately sent him to the hospital. Over the preceding 1 week, he has been experiencing recurrent brief episodes of transient loss of direction sense that were similar to his current presentation. However, they were self-limiting occurring less than 10 min for each episode, in contrast to the current episode that lead to hospital admission, which was persistent.

On admission, he was alert and cooperative. He did not demonstrate any signs of low level perceptual impairment, hemineglect, simultagnosia or visual anogsias such as object anogsia or prosopagnosia. There was no focal limb weakness or cranial nerve palsy. Visual acuity was normal. However, there was left-sided homonymous hemianopia from the visual field assessment without left hemispatial neglect. Line bisection and line cancellation test was normal. His language function and episodic memory was intact. He scored fully for the mini mental state examination and was able to remember the events that had occurred before, during and after the onset of his symptoms.

A card-placing test was also performed. Two parts of the test assessed his ability to retain information on spatial locations of cards placed on the floor around him and also his ability to integrate information on the spatial locations of similarly arranged cards on changes of body directions. He scored well (29/30) for part A but performed poorly (4/30) for part B.

During his hospital stay, he frequently lost his way to the washroom and his room. He described the difficulty in remembering the positional relationship of the nurse's station, toilets and his bed. He knew he was near his

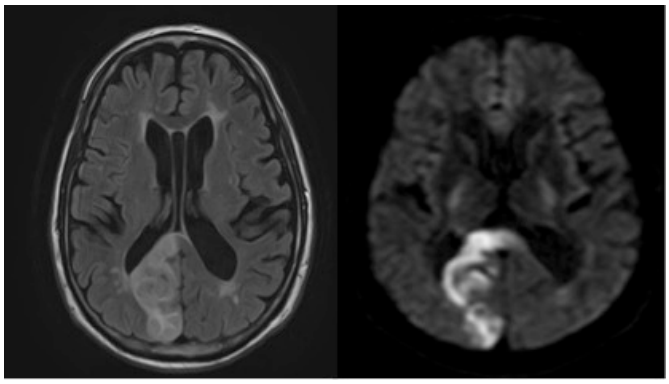

Figure 1 Magnetic resonance fluid attenuated inversion recovery and diffusion weighted imaging showing high signal intensity in the right medial occipital lobe that extends into the right retro-splenial area consistent with an acute infarction.

room by identifying the nurse's counter, but could not determine which direction he should take to return to his room.

MRI brain performed 3 days after his admission revealed an acute ischaemic infarct involving the medial aspect of the right occipital lobe that extended into the right retro-splenial area (figure 1). MRA also showed minimal irregularity of right posterior cerebral artery (P2 and P3 segment) in keeping with atherosclerotic changes. The cortical segment (P4) is also not visualised suggestive of thrombosis (figure 2). His heading disorientation gradually improved but he still had some trouble finding his way back home even 6 months after the stroke.

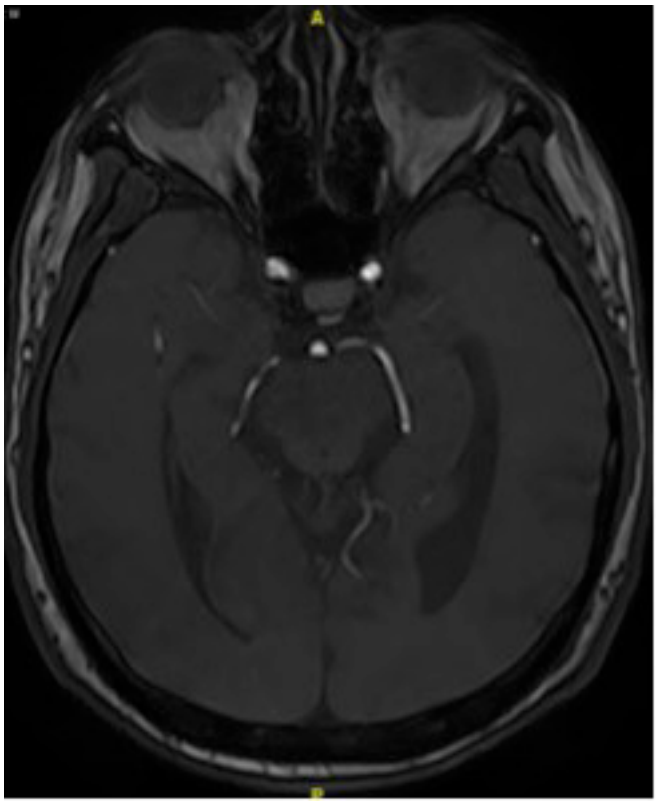

Figure 2 Magnetic resonance angiography (MRA) showing atherosclerotic changes of the right PCA artery. Irregularity of the P2 and P3 segments was noted with non-visualisation of the P4 segment suggestive of thrombosis. PCA, posterior cerebral artery.

DISCUSSION

Topographical disorientation is defined as the loss of ability to navigate one's way within familiar environment. This symptom is observed in patients with focal or diffuse brain damage. Aguirre and D'Esposito proposed four varieties of topographical disorientation namely egocentric disorientation, landmark agnosia, anterograde disorientation and heading disorientation.[1]

Patients with egocentric disorientation exhibit severe deficits as to the relative locations of objects in reference to the self. On the other hand, landmark agnosia refers to the inability to recognise salient or prominent environmental features for the purpose of orientation. In anterograde disorientation, only impairment in new and unfamiliar environment is seen. Ability to navigate in familiar environment is retained.

Heading disorientation is a distinct variety of topographical disorientation in that patients can represent the relative locations of objects and recognise landmarks but unable to derive directional information from landmarks to reach a destination. There are evidences that retro-splenial cortex is involved with spatial navigation. Excision of retro-splenial cortex of rats can impair spatial navigation and functional neuroimaging studies also revealed that the retro-splenial area was activated during large-scale navigational tasks.[2 3] Case series have indicated that the right retro-splenial region is the critical site for heading disorientation. Hashimoto *et al* demonstrated three patients with heading disorientation with lesions localised to the right retro-spenial cortex all caused by ischaemic infarction.[4] A systematic study of topographical memory and PCAI also found topographical memory disorders following PCAI to be common in 50% of the patients. Patients with right PCAI were more severely affected than left PCAI demonstrating that while both hemispheres seem involved in spatial memory, the posterior regions of the right hemisphere are particularly crucial in subserving spatial memory mechanisms.[5] Damage to the left retro-splenial region has been reported to be associated not with heading disorientation but with episodic memory deficits.[6]

Card placing test has recently proposed to be a useful tool in diagnosing heading disorientation. All three patients in their series have lesions in the right occipital lobe that extended into the right retro-splenial area confirmed on MRI. Part A of the test requires the subject to remember the spatial locations of three different cards placed surrounding the subject, while part B requires the subject to recall the spatial locations of different cards on changes of body direction. Our findings were similar where the patient scored normal for part A, but experienced great difficult in performing part B. This suggests

that the egocentric reference frame was intact to represent the spatial locations of surrounding objects but he was unable to use the information on changes in their body direction due to defective processing or integration of directional signals of the self.[4]

The diagnosis of TIA depends on the presence of a transient neurological deficit caused by ischaemic origin fitting a vascular territory. Symptoms such as loss of muscle power, sensation or vision are well represented in TIA episodes. Transient heading disorientation, however, has never been reported as a TIA-like symptom heralding acute cerebral infarction. Thus, recognising acute recurrent heading disorientation as an atypical symptom of TIA would be important, leading to urgent investigation and treatment that yields reduction in stroke risk. Our case, combined with other available reviews further reinforces that damage to the right retro-splenial region is responsible for heading disorientation.

Contributors CYC designed and conceptualised study, analysed the data, drafted manuscript for intellectual content. OBH organised and supervised the course of the project, critically reviewed the article.

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