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 a 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 anognias such as object anognia 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
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 grad-
ually improved but he still had some trouble finding his
way back home even 6 months after the stroke.

**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 egocen-
tric disorientation, landmark agnosia, anterograde disori-
entation and heading disorientation.

Patients with egocentric disorientation exhibit severe
deficits as to the relative locations of objects in refer-
ence 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 topo-
 graphical disorientation in that patients can represent
the relative locations of objects and recognise land-
marks but unable to derive directional information from
landmarks to reach a destination. There are evidences
that retro-splenial cortex is involved with spatial naviga-
tion. 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. Case series have
indicated that the right retro-splenial region is the crit-
ical site for heading disorientation. Hashimoto et al
demonstrated three patients with heading disorientation
with lesions localised to the right retro-splenial cortex all
caused by ischaemic infarction. A systematic study of
topographical memory and PCAI also found topographi-
cal 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 particu-
larly 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 occip-
tal 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 experi-
enced great difficult in performing part B. This suggests

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**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.

**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.
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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