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Turning the world upside down: reversal-of-vision metamorphopsia in a patient with syncope

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Accepted 30 November 2023

SUMMARY

An elderly man with recurrent syncope was admitted with a globe rupture following a syncopal attack. After an initial unremarkable evaluation, the patient reported inversion of the room's wall clock during a bedside evaluation. This symptom is called reversal-of-vision metamorphopsia (RVM) and is a rare visual disturbance that typically results from organic processes localised to the retina and/or posterior cortex of the brain or in some cases is psychogenic in nature. In this case, both the syncope and RVM were caused by impaired circulation in the posterior cortex, and management included an antiplatelet agent, statin and permissive blood pressure targets, which resulted in the correction of RVM.

BACKGROUND

Syncope, a temporary loss of consciousness due to cerebral hypoperfusion, is a common clinical syndrome that may result from a variety of conditions that range from mild and self-limiting to life-threatening. Reversal-of-vision metamorphopsia (RVM) is an uncommon symptom where a patient's visual field is temporarily rotated 180° in the coronal plane, so it appears upside down. It was first described in the 19th century as a symptom of hysteria.[1] The most common aetiologies of RVM include acute cerebral infarct of the posterior circulation and disruptions of the vestibular system from various causes including Ménière's disease, endolymphatic sac tumour, herpes zoster infection of the vestibular nerve or damage to the vestibular nerve during surgery.[2] The exact pathophysiology of RVM is incompletely understood, but it is thought to involve the impairment of the complex neurologic and sensory networks that integrate visual, vestibular and tactile stimuli. The resulting inability to process the normally inverted retinal images may explain RVM.[2] As there is redundancy in these pathways, other pathways promptly re-establish spatial orientation, and the symptom is usually short-lived.[2] This case describes the co-occurrence of syncope and RVM.

CASE PRESENTATION

A man in his early 80s with a history of coronary artery disease, type 2 diabetes mellitus and a recent presumptive diagnosis of primary lateral sclerosis (PLS) presented to the emergency department following a third episode of syncope in 3 months. The episodes always occurred while walking and were characterised by a festinating and accelerating gait followed by a sudden loss of consciousness. The most recent incident involved him falling on his face, rupturing his globe.

On presentation, he reported right eye pain and loss of vision. He denied unilateral weakness or numbness, facial droop, dysarthria, aphasia, dizziness, visual changes in his unaffected eye, chest pain, palpitations or shortness of breath. His vital signs were notable for a blood pressure of 160/76 mm Hg, heart rate of 68 beats per minute and normal oxygen saturation. Orthostatic blood pressure measurements were normal. Physical examination revealed that he could only perceive light with his right eye. There was 360° haemorrhagic chemosis and total hyphema. Neurologic examination was notable for mild spasticity of the upper extremities and 3+ tendon reflexes (brachioradialis, patellar and Achilles). These neurologic findings had been noted prior to this presentation and attributed to PLS. The remainder of his physical examination was unremarkable. He was admitted for workup of syncope and surgical management of globe rupture.

INVESTIGATIONS

The only abnormalities on the complete blood counts and metabolic panel were a blood glucose of 242 mg/dL and a mild leucocytosis of 11×10^9/L, which resolved within 24 hours. An ECG showed sinus rhythm with a PR interval of 219 ms and left anterior fascicular block. He was monitored on telemetry and had a normal cardiac rhythm throughout his hospitalisation with intermittent periods in Mobitz type 1 heart block. A contrast echocardiogram with agitated saline showed no structural abnormalities including right to left shunts. Cervical spine MRI showed multilevel degenerative changes of the cervical spine with moderate to severe central canal stenosis. An MRI of the brain performed 3 months earlier, as part of

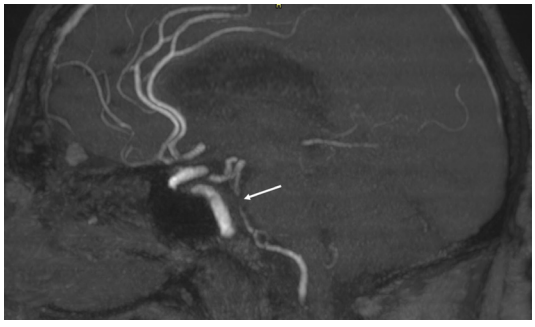

Figure 1 Sagittal time-of-flight MR angiogram of the head depicting loss of flow-related enhancement in the basilar artery (arrow), suspicious for arterial occlusion without acute infarct.

To cite: Mullen C, Jacobs Z, Pettersson D, *et al*. *BMJ Case Rep* 2023;**16**:e255453. doi:10.1136/bcr-2023-255453

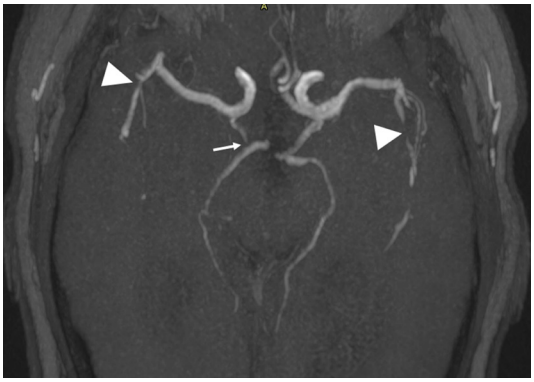

Figure 2 Axial time-of-flight MR angiogram depicting loss of flow-related enhancement in the right posterior communicating artery (arrow) and in bilateral M2 middle cerebral artery branches (arrow heads), suspicious for flow-limiting steno-occlusive disease without acute infarct.

his workup for PLS, had demonstrated age-related atrophy and chronic microvascular ischaemic disease.

On the third day of admission, the patient suddenly developed 180° rotation of his vision, noting that the wall clock and the medical team were 'upside down'. The symptom occurred while the patient was lying in bed, lasted less than 30 s and resolved spontaneously. This was recognised as RVM. Subsequent magnetic resonance angiogram (MRA) of his brain revealed numerous occlusions and stenoses without any areas of acute infarct in the anterior and posterior circulations, including bilateral M2 middle cerebral artery branch stenosis, right posterior communicating artery stenosis, basilar artery stenosis and left vertebral artery origin stenosis (figures 1–3).

DIFFERENTIAL DIAGNOSIS

The differential diagnosis for his initial presentation of syncope fell into three main categories: cardiovascular causes, including tachyarrhythmias or bradyarrhythmias, structural heart diseases and pulmonary embolism; orthostasis, including hypovolaemia, medication-related and autonomic failure; and reflex-mediated syncope, such as vasovagal and situational. Seizure and transient ischaemic attack were also considered. Based on his age and the sudden onset, there was high suspicion of arrhythmia. Dysautonomia related to known PLS leading to orthostasis was

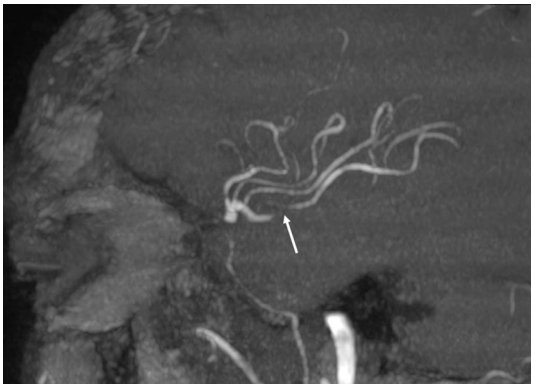

Figure 3 Sagittal time-of-flight MR angiogram depicting segmental loss of flow-related enhancement in an inferior left M2 middle cerebral artery branch (arrow), consistent with arterial occlusion without acute infarct.

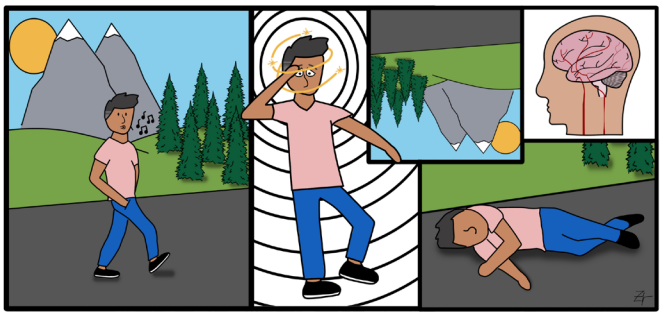

Figure 4 A visual representation of the patient's experience. Because of the flow-limiting stenoses, relatively small changes in heart rate and blood pressure can lead to impaired blood flow to the brain causing syncope and reversal-of-vision metamorphopsia. Illustration created by Dr Zachary Jacobs.

considered but thought less likely given normal orthostatic vitals during the admission. Despite the patient remaining completely lucid and exhibiting no other seizure-like activity or postictal period nor indeed any clear cause for seizure on laboratory tests or imaging, it is still theoretically possible that this episode represented a seizure episode. An electroencephalogram (EEG) was not obtained.

The MRA findings of flow-limiting stenosis led us to theorise that inadequate perfusion of the posterior cortex resulted in both orthostatic syncope and RVM.

TREATMENT

The patient was started on aspirin 81 mg and atorvastatin 40 mg daily. His blood pressure goals were liberalised to <160/90 mm Hg, from a previous goal of <135/85 mm Hg, in an effort to preserve cerebral perfusion. Given the multiple areas of vascular stenosis on cerebral imaging, he was not considered to be a candidate for any procedural intervention such as intracranial stenting. His ruptured globe was managed with surgical repair.

OUTCOME AND FOLLOW-UP

Unfortunately, the patient lost all vision in the right eye as a result of his injury. Over the following year, though he continued to have episodic syncope and/or falls, he did not experience any more episodes of RVM. Two years later, he had an ischaemic stroke and was diagnosed with dementia. Recent MRI of the brain showed ventriculomegaly.

DISCUSSION

Metamorphopsia is a broad description of differing forms of visual disturbances where the object appears distorted in shape, size, location or colour. RVM is also called inversion illusion, room-tilt illusion or upside-down vision and is a rare symptom characterised by the sudden and transient 180° rotation of the visual image in the coronal plane. The underlying aetiologies described in other case studies are numerous, primarily consisting of central causes, such as posterior circulation strokes, transient ischaemic attacks, focal seizures, migraine, concussion, intracranial haemorrhage or abscess, acute episodes of demyelinating disease and opioid toxicity.[1–4] Based on other case reports, this symptom tends to localise anatomically to the posterior parietal-occipital cortex.[2 4]

There are three other case reports of RVM coexisting with transient loss of consciousness. Gondim *et al* described a 76-year-old man with multiple episodes of RVM who was found conscious on the floor by his wife but does not

mention or imply syncope. The aetiology of his RVM was hypothesised to be from abnormal activity in subcortical nuclei, which could not be recorded by surface EEG.[5] Unal *et al* described a 16-year-old man who had two episodes of RVM and altered consciousness. Both were related to seizure, not syncope.[4] Finally, Stracciari *et al* described a 52-year-old woman who experienced RVM without syncope and was ultimately diagnosed with vertebrobasilar failure from subclavian steal syndrome.[6]

In the case described here, the distribution of basilar and vertebral artery stenoses can explain both syncope and the patient's visual symptomatology. Posterior circulation infarcts and interruptions to the blood flow of the vestibular system have previously been shown to cause RVM.[2] In this case, the combination of flow-limiting stenoses with small changes in cardiac output and an overly restrictive blood pressure goal is suspected to have resulted in hypoperfusion of the posterior circulation and vestibular system, leading to RVM and, if persistent, syncope (figure 4).

For patients who experience RVM, the treatment depends on the aetiology. Prior cases have involved treatments such as removal of tumour, antiepileptics, antimigraine medications, medications targeting multiple sclerosis plaques and withdrawal of toxins. In this case, the RVM suggested that flow-limiting stenosis in the posterior circulation was clinically significant. Therefore, the pharmacologic strategy focused on preventing further stenoses, by adding anti-platelet and cholesterol lowering agents, along with liberalising the target blood pressure goals in order to maintain cerebral perfusion.

Learning points

- Syncope is a common clinical syndrome, where identification of the causative stimulus can be challenging.
- Reversal-of-vision metamorphosis (RVM) is a rare visual phenomenon where the visual field is vertically flipped 180° in the coronal plane. It may be caused by a variety of issues, both organic and psychogenic, including lesions in the retina and/or brain often localising to the posterior cortex.
- In this case, we believe flow-limiting stenoses of the posterior circulation led to the co-occurrence of RVM and orthostatic syncope.

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Contributors The following authors were responsible for drafting of the text, sourcing and editing of clinical images, investigation results, drawing original diagrams and algorithms and critical revision for important intellectual content: CM, ZJ, DP and AH. The following authors gave final approval of the manuscript: CM, ZJ, DP and AH.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Consent obtained from next of kin.

Provenance and peer review Not commissioned; externally peer reviewed.

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