Reversal of vision metamorphopsia caused by pons and cerebellum infarction

Metamorfopsja odwróconego widzenia w przebiegu udaru niedokrwiennego mostu i móżdżku

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Abstract

Metamorphopsia is a visual illusion related to the perception of an object's shape, size, colour or angle. Reversal of vision metamorphopsia is a rare, transient form of metamorphopsia described as an inversion of the field of vision, usually a 180-degree reversion within the frontal plane. We describe the case of a 64-year-old male patient who first experienced a 90-degree rotation of the field of vision and then had the impression of his body rotating in space. The symptoms were preceded by disequilibrium, astigmatism and vomiting. Magnetic resonance imaging of the head showed focuses of vasogenic lesions in the pons and left cerebellar hemisphere. Magnetic resonance angiography of cerebral vessels did not reveal the left vertebral artery. This is the first described case of reversal of vision metamorphopsia with 90-degree rotation of the field of vision with accompanying disorder of the spatial position of the body.

Key words: metamorphopsia, reversal of vision, stroke.

Streszczenie

Metamorfopsja jest złudzeniem wzrokowym dotyczącym kształtu, rozmiaru, koloru lub kąta nachylenia przedmiotów. Metamorfopsja odwróconego widzenia to rzadka, przemijająca forma metamorfopsji, opisywana jako odwrócenie pola widzenia, zwykle o 180° w płaszczyźnie czołowej. W pracy opisano przypadek 64-letniego mężczyzny, który doświadczył odwrócenia pola widzenia o 90°, a następnie miał wrażenie rotacji własnego ciała w przestrzeni. Powyższe objawy poprzedzone były zaburzeniami równowagi, niezbornością i wymiotami. Badanie za pomocą rezonansu magnetycznego (RM) głowy wykazało ogniska o charakterze zmian naczyniopochodnych w górnej części mostu po stronie prawej oraz w lewej półkuli móżdżku. Badanie angio-RM naczyń mózgowych nie uwidoczniło tętnicy kręgowej lewej. Jest to pierwszy opis metamorfopsji odwróconego widzenia o charakterze rotacji pola widzenia o 90°, z towarzyszącym zaburzeniem ułożenia ciała w przestrzeni, w przebiegu uszkodzenia mostu i móżdżku.

Słowa kluczowe: metamorfopsja, odwrócenie pola widzenia, udar mózgu.

Introduction

Metamorphopsia is a visual illusion related to the perception of an object's shape, size, colour or angle. Reversal of vision metamorphopsia (RVM) is a rare, transient form of metamorphopsia described as an inversion of the field of vision, usually a 180-degree reversion within the frontal plane [1].

The first case of metamorphopsia was described by Winslow in 1868 as a symptom of hysteria [2]. Several other similar cases have been described, some with organic causes: occipital and parietal cortex injury, eighth

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nerve, brain stem or cerebellar injury, as well as with psychogenic causes in various disease entities. Symptoms of inverted vision have been observed in patients with cerebral stroke, brain tumour, head injury, epilepsy, migraine and multiple sclerosis [1-7].

Case report

A 64-year-old, right-handed patient was admitted to the Department of Neurology for diagnostic procedures related to transient balance disorders, astigmatism, vomiting, and visual disorders. A month before hospitalisation, in the morning, about 60 minutes after waking up, while taking a shower the patient had an attack of weakness and astigmatism – he could not reach the showerhead or the soap. The symptoms disappeared after several minutes. Thirty minutes later, while taking a walk, he suffered from sudden disequilibrium, swaying from side to side, vomiting several times, and buzzing in the ears. An ambulance was called. While waiting, the patient had an attack of 90-degree inversion of the field of vision in the coronal plane (clockwise). He saw people turned 90 degrees, as if lying down, trees were horizontal, and the ambulance was coming horizontally down the road, which was also turned 90 degrees. During the ride to the hospital, the patient, lying on his back, had the impression that he was lying on a bed turned 90 degrees, and above him, the attendant was sitting on a chair placed on the wall of the ambulance. The patient had the impression that he would fall off the bed and that the attendant would fall off the chair onto him. He saw through the window that the ambulance was moving horizontally – the road was turned 90 degrees, and the ambulance was moving below and above horizontally growing trees. The inversion of the field of vision lasted about 30 minutes. When the patient arrived at the hospital and left the ambulance, the impression receded. The patient was admitted to the laryngology department. After about 2 hours, the disequilibrium and nausea also receded. The information chart shows that during the first day of hospitalisation, nystagmus when looking left was observed. The patient was discharged home after two days of hospitalisation. During the next month the patient suffered from dull headaches with slight intensification in the occipital area, with additional uncertainty when walking.

The patient had not suffered from any serious disease until then. Twelve years ago, during a ride on a bus, he had an incident of disordered consciousness with an accompanying impression of levitating above the other passengers. The symptoms lasted for several dozen minutes.

Neurological examination performed after admission indicated a discrete, marked coarse nystagmus when looking left and a positive Romberg test with swaying from side to side, without significant lateralization.

Basic laboratory tests – blood cell count, urinalysis, ESR, CRP, blood clotting parameters, BUN, creatinine, TSH, AST, ALT, lipid profile, and glycaemic profile – did not demonstrate any abnormalities. Electronystagmography revealed disorders within the atrium, disorders of mixed types with a predominance of the centrifugal type, with suggested localisation in the stem and secondary function of the left labyrinth. Magnetic resonance imaging (MRI) of the head was carried out, which showed vasogenic lesions: 0.5 cm in diameter in the upper part of the pons on the right side (Fig. 1), and 8 × 3 mm in the left cerebellar hemisphere (Fig. 2). Magnetic resonance angiography (MRA) examination of the cerebral blood vessels did not reveal the left vertebral artery (Fig. 3); simultaneously computed tomography (CT) angiogram of carotid and vertebral arteries within the section preceding the skull revealed a hypoplastic left vertebral artery, 1.9 mm in diameter, contrasted to the level of C3 core, then a very narrow, 1 mm in diameter, occurring at the level of the occipital hole and connecting with the right vertebral artery (Fig. 4). Electroencephalography (EEG) revealed slight changes within the posterior temporal leads and occipital leads in the form of singular, occasional sharp waves, as well as slight changes with features of paroxysmal cerebral dysrhythmia within the same areas, in the form of groups and 2-second series of alpha, beta and theta waves, next to singular sharp waves with a tendency to become more general waves, provoked during hyperventilation.

Discussion

Only about 30 cases of RVM have been described to date. Based on the available description, it is known that the occurrence of this symptom is always sudden, transient and short-lasting, as it lasts from several seconds to about 180 minutes, on average about 15 minutes, and is based on the rotation of the field of vision without any other spatial distortions [1,3,5]. The most often described was a clockwise 180-degree rotation, in the coronal plane [1-7]. The chief cause of RVM is ver-

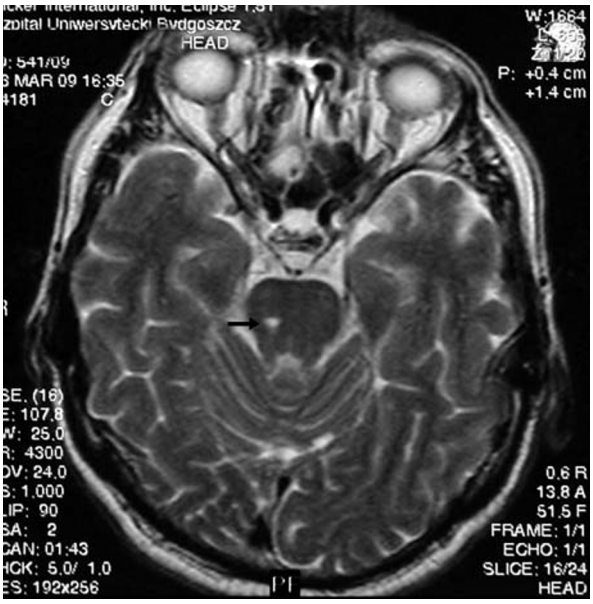

Fig. 1. Magnetic resonance imaging of the head showing a focus of a vasogenic lesion, 0.5 cm in diameter, in the upper part of the pons on the right side

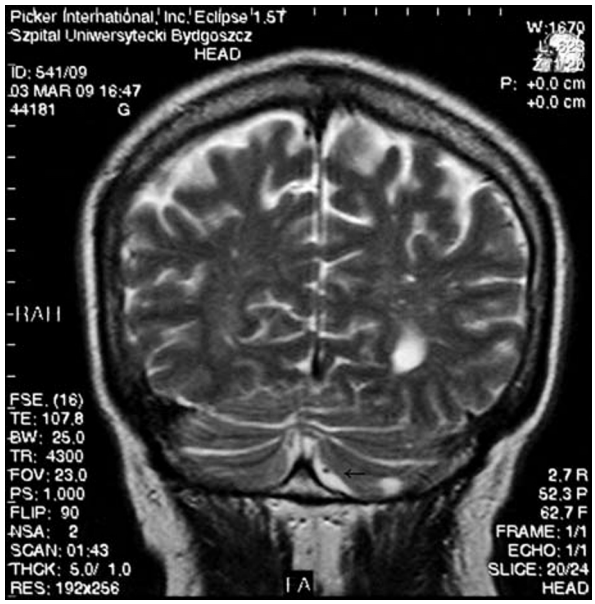

Fig. 2. Magnetic resonance imaging of the head showing a focus of a vasogenic lesion, 8 × 3 mm, in the left cerebellar hemisphere

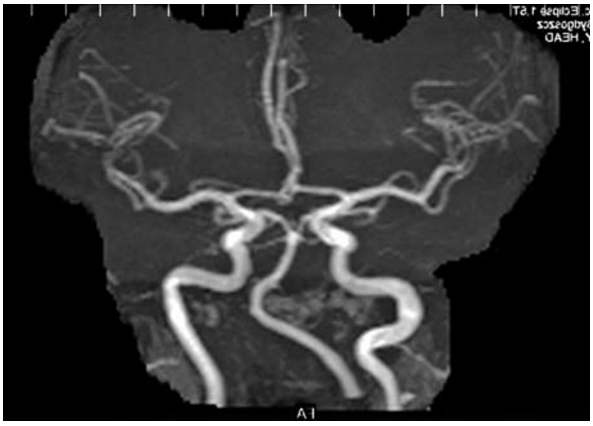

Fig. 3. Magnetic resonance angiography of the cerebral blood vessels does not reveal the left vertebral artery

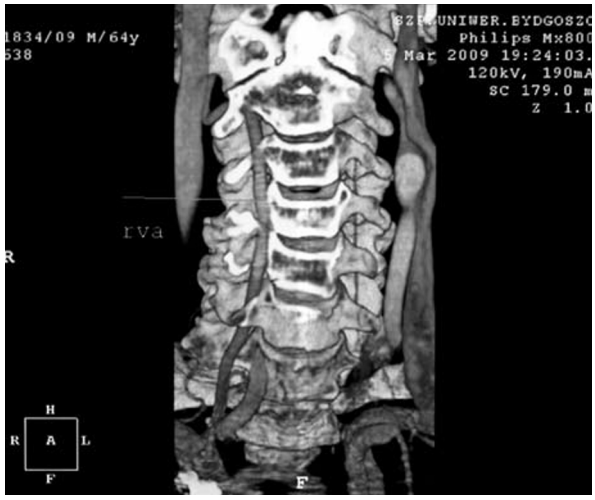

Fig. 4. Computed tomography angiogram of the carotid and vertebral arteries within the section preceding the skull reveals a hypoplastic left vertebral artery, 1.9 mm in diameter

tebrobasilar ischaemia, although the phenomenon has also been linked to many other conditions, such as multiple sclerosis, epilepsy, migraine, labyrinthine disorders, tumours or traumatic head and neck injuries [1,4,6, 8-11]. River *et al*. describe a 60-year-old patient with stroke in the frontal lobes and cerebellar peduncles, who suffered from an upside-down inversion of vision lasting 3 hours – he saw people walking on their heads and a cup of tea placed on a shelf 'upside down', but the tea did not spill [3]. Kommerell reports a case of a 60-year-old woman, who experienced a severe spatial disorientation after sudden interruption of the right vestibulocochlear nerve (on removal of an acoustic neurinoma). She saw her husband approaching her bed upside down [10]. Thus far, only isolated cases concerning inversion of the field of vision, which did not exceed 180 degrees, have been described in the literature [3].

Our patient experienced a 90-degree rotation of the field of vision with simultaneous disorders related to the position of the body in space. Such a combination of symptoms is extremely rare – in the majority of cases, the rotation concerns only the space outside the patient and not the patient himself. River suggests that RVM is a spa-

tial visual illusion, being a response to injury of the occipital cortex or cerebellum, whereas a change of bodily orientation within space results from the dysfunction of the auricular centres in the brain stem [3]. According to the literature, about 40% of patients with RVM had infratentorial lesions, whereas only 20% had parieto-occipital lesions, and most of them had a single lesion [3]. In the case of our patient, the MRI examination of the head revealed 2 foci: in the brain stem and in the cerebellum. It is possible that the first one was responsible for the change of bodily orientation within space, whereas the focus in the cerebellum caused the rotation within the field of vision. The mechanism of the above symptoms is difficult to define. Probably lack of information due to the brainstem lesion, in particular disturbance of the vestibular centres and central otolith pathway, together with the cerebellar lesion, deprived higher brain centres of necessary information about the head position in the roll plane, which is the plane relevant to reversal of vision.

Levitation of the body, noted in 3 patients with RVM thus far, was usually preceded by reversal of vision [3]. Injury of the brain stem is the most probable cause of this symptom. Other known causes of levitation are stroke, epileptic seizure, migraine and drugs [9]. Levitation is a part of out-of-body experience – a brief subjective episode in which the self is perceived as being outside the body (disembodiment), with or without the impression of seeing the body from an elevated and distanced visuospatial perspective (autoscopy). It has been suggested that out-of-body experiences are the result of a transient failure to integrate the visual, tactile, proprioceptive, and vestibular information that converges at the temporoparietal junction, especially on the right side of the brain [12]. Foyaca-Sibat *et al*. described 3 cases of patients with a short lasting sensation of levitation without loss of consciousness as a symptom of insular epilepsy caused by insular neurocysticercosis [9]. Positron emission tomographic scanning of other patients with out-of-body experience showed brain activation at the temporoparietal junction, the angular supramarginal gyrus junction and the superior temporal gyrus sulcus on the right side. Activation was also noted at the right precuneus and posterior thalamus, extending into the superior vermis [13]. In the past, our patient had experienced an isolated, transient event of levitation, which in connection with the current symptoms suggests circulatory disorders within the vertebrobasilar circulation. A vascular anomaly in the form of vertebral artery hypoplasia is most likely the reason for the disorders of the described case, but an epileptic background cannot be excluded.

In all previously described cases of patients affected by reversal of vision metamorphopsia, additional accompanying symptoms were observed, usually dizziness, disequilibrium, vomiting and malaise. In most cases, nystagmus and ataxia, and rarely hemiparesis and hemianopsia, were diagnosed during neurological examination [1-8].

The image we see is created in the occipital cortex by inversion of the reversed image reaching the retina. Therefore, each disorder of the mechanisms involved in this reinversion may cause RVM [8]. Variability of the injury location probably results from the multifunctional nature of neurons in the occipital cortex, especially the area responsible for vision and spatial integration of the image. To create a valid representation of space, a series of coordinate frame transformations is performed. Ocular position information is combined with retinal inflow to produce a head-centred representation. To represent body-centred coordinates, the 7a parietal cortex and the intraparietal area have neurons that respond to the eye and head position. Otolith and vestibular inputs, together with proprioceptive information from neck muscles, give information about the position of the head. These signals, together with eye and retinal position information, can encode locations in world-based coordinates. Cells in the posterior parietal region are multimodal and can be activated by both visual and integral vestibular signals to form the representation of space. This orientation system is widely distributed in the central nervous system [3,9-11]. Therefore, any damage or disturbances occurring in the above-mentioned structures or in the place of their integration may lead to the reversal of vision. This might explain the various locations of insults causing this phenomenon. In the case of our patient, the double infratentorial lesion could be responsible for the uncommon symptoms, although the exact mechanism remains unclear.

According to the available literature, our patient is the first described case of reversal of vision metamorphopsia with 90-degree rotation of the field of vision, with an accompanying disorder of the spatial position of the body, in the course of pons and cerebellar injury.

Disclosure

The authors report no conflict of interest.

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