

## BASILAR IMPRESSION AS A POSSIBLE CAUSE OF CEREBELLAR STROKE: CASE REPORT

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**SUMMARY** – A case is reported of a 72-year-old woman who presented with severe vertigo, vomit, and mild neck and occipital pain. She had a medical history of hypertension, angina pectoris, cholelithiasis, gastric ulcer, pyelonephritis and periodical mild dizziness. Neuroimaging revealed right vertebral artery occlusion, right cerebellar stroke and basilar impression. The therapeutic approach chosen in our patient was conservative, with non-steroid anti-inflammatory drugs and neck collar. Although our patient's prior risk factors for stroke supported a diagnosis of vertebrobasilar stroke, it is possible that the vertebral artery occlusion was the result of changes in the atlantoaxial anatomy and that cerebellar infarction was secondary to craniocervical anomaly. Although the presence of vertebral artery occlusion, cerebellar stroke and basilar impression in our patient may have been coincidental, we suggest that patients with basilar impression and craniocervical anomalies in general may be at an increased risk of vertebrobasilar vascular disease and vertebrobasilar stroke.

**Key words:** *Brain infarction; Vertebral artery; Atlanto-occipital joint – abnormalities*

### Introduction

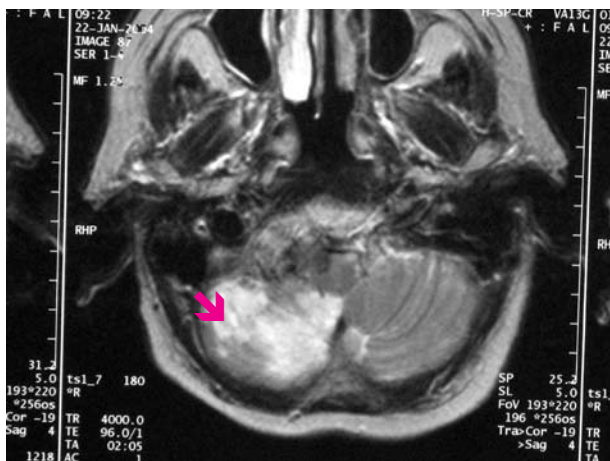
Eighty to eighty-five percent of all strokes are ischemic and among them 20% occur in the vertebrobasilar system<sup>1</sup>. At the same time, basilar impression is an uncommon syndrome that occurs when the superior part of the odontoid/atlas migrates upward. It occurs congenitally, in persons with bone diseases or occasionally due to ligamentous laxity and vertical subluxation of C1 on C2 caused by injury. It may lead to static or dynamic stenosis of the foramen magnum and obstructive hydrocephalus or compression of medulla oblongata and sudden death<sup>2</sup>.

The superior level of the odontoid is measured in relation to several reference lines. Diagnostic tools for basilar impression are plain lateral x-ray with odon-

toid views, flexion/extension magnetic resonance imaging (MRI), plain computed tomography (CT) scan and somatosensory evoked potentials (SSEPs)<sup>3</sup>. The symptoms of basilar impression may become apparent when the neck is bent: periods of confusion, dysphagia or dysarthria, dizziness, loss of sensation, pain in the back of the head and loss of the proprioception, tingling or numbness in the fourth and fifth fingers and/or in the middle part of the forearm, tingling when the neck bends forward or backward and weakness or stiff, awkward movements of the arms and legs<sup>4</sup>. Considering therapy for basilar impression, there are two major approaches: conservative approach in case of no neurologic symptoms, which consists of non-steroid anti-inflammatory drugs (NSAID), neck traction and neck collar. In the presence of neurologic symptoms and signs and when cord compression is confirmed by MRI, neurosurgical approach is a therapeutic choice. However, patients are considered to be at a surgical risk, neurologic progression is likely, and the one-year prognosis is poor<sup>5</sup>.

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*Fig. 1. Magnetic resonance image: a large ischemic infarct of the right cerebellar hemisphere in the vascular territory of the right vertebral artery.*

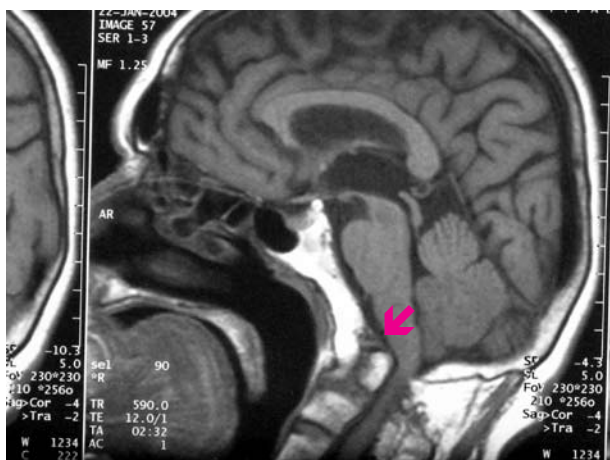
### Case Report

We report on a case of a 72-year-old woman who presented to our Department with severe vertigo, feeling she might lose consciousness, and mild neck and occipital pain, vomiting on several occasions, and no history of head trauma. She was fully conscious, her blood pressure was 180/100 mm Hg. Physical examination at admission showed vertical multidirectional nystagmus worsened by gaze fixation, anisocoria (the right pupil wider than the left one) and slowness of

pupillary light response. Clumsiness of the right arm with overshoot/undershoot phenomena and truncal ataxia with difficult walking and sitting was revealed. Plantar stimulation elicited Babinski response on the left side. There was no objective deficit on sensory examination. The patient had medical history of hypertension, angina pectoris, cholelithiasis, gastric ulcer, pyelonephritis and periodical mild dizziness during her life. She was a non smoker. She was taking ACE inhibitors, beta-blockers and NSAID. Laboratory studies were normal including blood gas analysis, complete blood cell and platelet count, erythrocyte sedimentation rate, blood electrolytes, creatinine, liver enzymes, cholesterol, triglycerides, prothrombin and partial thromboplastin time. Electrocardiogram revealed normal sinus rhythm and left ventricle hypertrophy.

Brain CT scan performed immediately upon admission to the hospital showed no abnormalities of the brain or cerebellum, but discovered pathology of the craniovertebral junction with an abnormal position of the right axis and invagination in the foramen magnum, i.e. basilar impression.

Color and power Doppler flow imaging of the carotid and vertebral arteries showed a right vertebral artery occlusion. Skull roentgenograms revealed a brachiocephalic type of neurocranium, fragmentation of the dens of the axis, and separation from the C2 corpus with dorsal dislocation. It suggested the pos-



*Fig. 2. Magnetic resonance image: dens protrusion into the infratentorial region, compression and reduction of the anterior subarachnoid space with no compression of the medulla spinalis – basilar impression.*



*Fig. 3. Magnetic resonance angiography: occlusion of the right vertebral artery.*

sible fracture of the dens of the axis with residual dislocation or perpendicular fracture of the C2 vertebra corpus.

MRI scan of the brain performed 3 days after the onset of symptoms showed a large ischemic infarct of the right cerebellar hemisphere in the vascular territory of the right vertebral artery (Fig. 1), dens protrusion into the infratentorial region, compression and reduction of the anterior subarachnoid space with no compression of the medulla spinalis (Fig. 2). Magnetic resonance angiography confirmed occlusion of the right vertebral artery (Fig. 3).

The therapeutic approach chosen in our patient was conservative, with NSAIDs and neck collar. The patient left our Department 10 days later with no neurologic deficit.

## Discussion

Although our patient's prior risk factors for stroke such as hypertension and coronary artery disease supported the diagnosis of vertebrobasilar stroke, it is possible that occlusion of the vertebral artery was the result of changes in the atlantoaxial anatomy and cerebellar infarction was secondary to craniocervical anomaly.

Up to now, correlation between basilar impression and vertebrobasilar stroke has been reported only in few cases. Dickinson *et al.* have reported on a case of a 50-year-old man with myelopathy secondary to basilar impression who developed bilateral vertebral artery dissection after undergoing treatment with 8 pounds of cervical traction. The vertebral artery dissection resulted in vertebrobasilar insufficiency and posterior circulation stroke. They suggested that vertebral artery injury may have resulted from attempted reduction of severe basilar impression<sup>6</sup>. Kasai *et al.* suggest that mechanical stress on bilateral vertebral arteries may have caused infarctions in the territories of the posterior circulation of their patient with basilar impression who presented with medial longitudinal fasciculus syndrome<sup>7</sup>. Although perioperative stroke is a rare complication of general surgery, Zotter *et al.* have postulated that muscle relaxation and cervical hyperextension during intubation in the presence of basilar impression resulted in vertebral artery dissection and stroke<sup>8</sup>. Basilar impression is also suggested as a potential cause of bilateral cerebellar infarctions in the

territories of bilateral posterior inferior cerebellar arteries by Ando *et al.*<sup>9</sup>. Finally, Piovesan *et al.* report on a patient with neurofibromatosis type 1 (NF1), basilar impression and a history of stroke four months before admission. Angiography revealed complete occlusion of both vertebral and left internal carotid arteries, and partial stenosis of the right internal carotid artery. It is an uncommon case of occlusive cerebrovascular disease associated with NF1, since most cases tend to spare the posterior cerebral circulation<sup>10</sup>.

Although the presence of vertebral artery occlusion, cerebellar stroke and basilar impression in our patient may have been coincidental, we suggest that patients with basilar impression and craniocervical anomalies in general may be at an increased risk of vertebrobasilar occlusive vascular disease and vertebrobasilar stroke.

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## Sažetak

## BAZILARNA IMPRESIJA KAO MOGUĆI UZROK CEREBELARNOG MOŽDANOG UDARA: PRIKAZ SLUČAJA

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Prikazuje se slučaj sedamdesetdvogodišnje bolesnice primljene na bolničko liječenje zbog jake vrtoglavice, povraćanja te blage zatiljne i boli u području vrata. Anamnestički se doznaje kako boluje od arterijske hipertenzije, pektoralne angine, žučnih kamenaca, želučanog ulkusa, pijelonefritisa te kako je do tada povremeno imala blaže vrtoglavice. Neuroradiološkom i ultrazvučnom obradom utvrđena je okluzija desne vertebralne arterije, ishemijski moždani udar u području desne hemisfere malog mozga i bazilarna impresija. Bolesnica je liječena konzervativno. Premda je bolesnica imala prethodno utvrđene rizične čimbenike za ishemijski moždani udar, moguće je kako je okluzija vertebralne arterije nastala uslijed poremećaja atlanto-aksijalne anatomije te kako je moždani udar u području malog mozga nastao kao rezultat prilježće kranio-cervikalne anomalije. Premda je povezanost okluzije vertebralne arterije, moždanog udara u malom mozgu i bazilarne impresije moguće slučajna, bolesnici s bazilarnom impresijom i anomalijama kranio-cervikalnog prijelaza možda imaju povećani rizik za nastanak okluzivnih promjena krvnih žila vertebro-bazilarnog sliva te posljedičnog ishemijskog moždanog udara u tom opskrbnom području.

Ključne riječi: *Mozak, infarkt; Vertebralna arterija; Atlanto-okcipitalni zglob – anomalije*