UNILATERAL OCCLUSION OF THE VERTEBRAL ARTERY AS A CAUSE OF BILATERAL PARESIS OF THE ABDUCENS NERVE - CASE REPORT

Sandra Vujovic 1,a, Slavisa Perunicic a, Mladen Debeljevic a and Milovan Roganovic a,b

1 Clinic for Neurology, Clinical Centre of Montenegro, Ljubljanska bb, 81000 Podgorica, Montenegro, 
b Faculty of Medicine, University of Montenegro, Krusevac bb, 81000 Podgorica, Montenegro

ABSTRACT Paresis/paralysis of the abducens nerve can be unilateral or bilateral. So far, several causes of unilateral paresis/paralysis of the abducens have been described: stroke, tumours, demyelinating diseases, infections and above all, trauma. This manuscript presents a 47-year-old lady with bilateral paresis of the abducens nerve. We described all the diagnostic procedures we have done to determine this disorder’s aetiology (laboratory, radiological and other analyses). The only pathological deviation that was discovered in our patient was unilateral occlusion of the vertebral artery. This is the first time that the unilateral occlusion of the vertebral artery has been correlated with a mentioned lesion of the sixth cranial nerves.

KEYWORDS vertebral artery; abducens nerve; paresis; case report.

Background

Cranial nerve six (CN VI), also known as the abducens nerve, is one of the nerves responsible for the extracocular motor functions of the eye, along with the oculomotor nerve (CN III) and the trochlear nerve (CN IV). This is a purely motor nerve whose main function is to carry general somatic efferent nerve axons to innervate the lateral rectus muscle, which then abducts the eye on the ipsilateral side. It is also secondarily involved in the innervation of the contralateral medial rectus muscle by way of the medial longitudinal fasciculus so that both eyes move laterally in a coordinated manner [1].

Paresis/paralysis of the abducens nerve can be unilateral or bilateral. So far, several causes of unilateral paresis/paralysis of the abducens have been described: stroke, tumours, demyelinating diseases, infections and above all, trauma [2]. On the other hand, according to the available literature data, bilateral paresis/paralysis of this cranial nerve is less common, and the described cases are head trauma, cerebrovascular diseases, endocrinological diseases, meningitis, brain stem infarction, supratentorial stroke, vasculitis and any space-occupying lesions [3].

In this case report, we present a female patient in whom unilateral occlusion of the vertebral artery led to a bilateral lesion of the abducens nerve.

Case presentation

Our patient is a 47-year-old lady who felt a severe occipital headache in the morning on the day of admission and then noticed instability and drift while walking. The patient denied previous head trauma. In the previous history, our patient had hypertension; she regularly consumes her antihypertensive therapy and a year before the current admission, she underwent in-situ cervical cancer (Ca PVU) operation, which did not require additional radiotherapy or chemotherapy addition; the patient does not consume tobacco, alcohol, drugs, has no allergies to food and drugs, and there were no diseases of heredity in her family.

The patient was referred to the Emergency Center of the Clinical Center of Montenegro, where she was examined by a neurologist who verified bilateral paresis of the abducens nerve. No nystagmus was detected, and the patient denied the presence of diplopia. A brain CT scan was performed, which did not
indicate pathological changes, so the patient was admitted to the Clinic for Neurology of the Clinical Center of Montenegro for additional examination.

In order to determine the aetiology of the mentioned bilateral lesion of the abducens nerve, we performed extensive additional diagnostic procedures. First, to exclude neuroinfection as a cause of the neurological deficit, we performed a lumbar puncture - clear cerebrospinal fluid was obtained, with normoglycorrhagia and without pleocytosis, and viral causes of neuroinfections were not detected by polymerase chain reaction (PCR). No malignant cells were detected in the cerebrospinal fluid sediment. All standard laboratory blood tests were normal, including complete blood count, heptagram, lipid status, electrolytes, serum protein and albumin levels, inflammatory parameters, angiotensin-converting enzyme (ACE), vitamin B12, and folic acid. Tumour markers were not elevated.

The hormonal status of the thyroid gland and the basic hormonal profile of the hypothalamic-pituitary-endocrine gland axis were normal. In order to determine the possible paraneoplastic syndrome, the recommended radiological screening was performed, which did not detect the presence of expansive changes in the thorax, abdomen and pelvis. No serum paraneoplastic antibodies were detected. The Hess-Lancaster test ruled out the presence of diplopia. An electromyoneurographic examination was performed, which did not detect the presence of neuropathy or myopathy.

Surprisingly, on the head and neck CT angiography, occlusion of the right vertebral artery was detected (Figure 1). In the further course of hospitalization, we performed an MRI of the endocranium and cervical spine, on which no pathological changes were detected. In order to determine the aetiology of the mentioned occlusion of the vertebral artery, the patient underwent additional haematological and genetic testing. In the therapeutic sense, we prescribed acetylsalicylic acid, hypolipidemic, and her regular antihypertensive therapy.

We concluded that the only possible cause of bilateral paresis of the abducens is the occlusion of the right vertebral artery.

Discussion

As mentioned before, to exclude all previously described causes of bilateral abducens nerve paresis, we performed several diagnostic procedures.

Acute polyradiculoneuritis, as the described cause of paresis of the abducens nerve [4], was ruled out by electromyoneurographic examination and cytobiochemical examination of the cerebrospinal fluid. Furthermore, our patient did not have any other clinical features of Bing-Neel syndrome, for which it has been previously described that it can be presented by a bilateral lesion of the abducens nerve [5].

In the domain of cerebrovascular diseases, having in mind first the clinical features, normal parameters of hemostasis, but also the finding of CT angiography, thrombosis of the venous sinuses of the head [6], ruptured aneurysm of the anterior communicating artery [7], subarachnoid haemorrhage [8] and aneurysm of the vertebral artery [9], previously described as the causes of bilateral paresis of the abducens, were excluded in our patient.

Conclusion

This is the first time the unilateral occlusion of the vertebral artery has been correlated with a mentioned lesion of the sixth cranial nerves.

List of abbreviations

| Abbreviation | Description                      |
|--------------|----------------------------------|
| ACE          | angiotensin-converting enzyme     |
| Ca PVU       | cervical cancer                  |
| CN           | cranial nerve                    |
| CT           | computed tomography              |
| PCR          | polymerase chain reaction        |

Conflict of interest

This work did not receive any grant from public, commercial, or not-for-profit funding agencies.

Consent for publication

Written informed consent to publish/present this case was obtained from the patient.

Ethical approval

Ethical approval is not required at our institution to publish an anonymous case report.

Acknowledgement

No acknowledgement.

References

1. Nguyen V, Reddy V, Varacallo M. Neuroanatomy, Cranial Nerve 6 (Abducens). In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2021 Jan-.
2. Keane JR. Bilateral sixth nerve palsy. Analysis of 125 cases. Arch Neurol. 1976 Oct;33(10):681-3.
3. Gaul C, Pfau M, Huk WJ, Heckmann JG. Bilateral paresis of the abducens nerve: report of two cases. Eur J Neurol. 2002 Nov;9(6):698-700.
4. Tatsumoto M, Odaka M, Hirata K, Yuki N. Isolated abducens nerve palsy as a regional variant of Guillain-Barré syndrome. J Neurol Sci. 2006 Apr 15;243(1-2):35-8.
5. Bhatti MT, Yuan C, Winter W, McSwain AS, Okun MS. Bilateral sixth nerve paresis in the Bing-Neel syndrome. Neurology. 2005 Feb 8;64(3):576-7.
6. Zaragoza-Casares P, Gómez-Fernández T, Zato-Gómez de Liaño MA, Zaragoza-García P. Superior sagittal sinus thrombosis and bilateral sixth-nerve palsy in a child with nephrotic syndrome. Pediatr Nephrol. 2007 May;22(5):753-5.
7. Jeon JS, Lee SH, Son YJ, Chung YS. Slowly recovering isolated bilateral abducens nerve palsy after embolization of ruptured anterior communicating artery aneurysm. J Korean Neurosurg Soc. 2013 Feb;53(2):112-4.

8. Garg K, Singh PK, Mahapatra AK, Sharma BS. Bilateral abducens nerve palsy associated with subarachnoid hemorrhage. Br J Neurosurg. 2014 Dec;28(6):771-5.

9. Jeon JS, Lee SH, Son YJ, Chung YS. Dissecting aneurysm of vertebral artery manifestating as contralateral abducens nerve palsy. J Korean Neurosurg Soc. 2013 Mar;53(3):194-6.